DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

METAL FINISHING

MAY, 1952 VOLUME 50 • NUMBER 5

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COMING SOON

Next month's issue will contain a complete and detailed program for the Annual A. E. S. Convention and Metal Finishing Exposition, with times and places noted for each event.

A comprehensive discussion of chrome plating baths using catalysts other than the usual sulfate addition.

The fundamental mechanism of phosphating, as studied using radioactive iron and phosphorus, is the subject of another interesting article.

An actual production installation for hard coating aluminum alloys for aircraft use will be described and illustrated.

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Published Monthly by

FINISHING PUBLICATIONS, INC.

Serving the electroplating and industrial coating fields with specialized monthlies and guidebooks since 1903. Companion publication, ORGANIC FINISHING.

Editorial, circulation and publishing office at 381 Broadway, Westwood, New Jersey. Telephone Westwood 5-1530. District advertising sales offices at 19 Elmwood Place, Hornell, New York, telephone Hornell 943, and 742 So. Hill Street, Los Angeles 14, California, telephone MAdison 6-5421.

Member

CCA — Controlled Circulation Audit

NBP — National Business Publications

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Subscription Information

United States and Canada $4.00 per year, other countries $8.00. Single copies 45c in U. S. and Canada, other countries 85c. Annual subscription for both METAL FINISHING and ORGANIC FINISHING, including annual GUIDEBOOKS, $5.00 in U. S. and Canada.

GUIDEBOOK-DIRECTORY 20th edition 1951 current, 588 pages 5¼ x 7⅞ $2.50. Please remit by check or money order; cash should be registered. All correspondence should be directed to **381 Broadway, Westwood, New Jersey.** Publisher reserves the right to reject any subscription which does not conform to his standards of buying power coverage. Request for change of address should reach us on or before the 15th of the month preceding the issue with which it is to go in effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice. In sending us your change of address please be sure to send us your old address as well as the new one.

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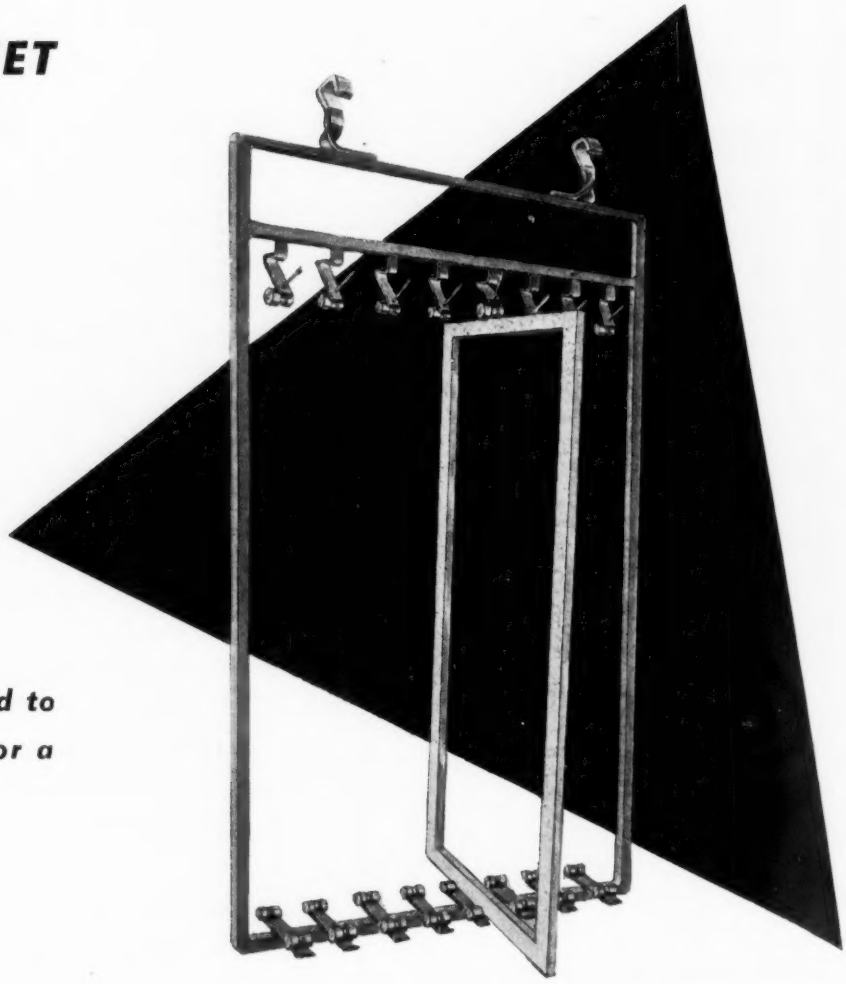

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The WASHINGTON OBSERVER

George W. Grupp

News and Views from The Nation's Capitol

. There is an improvement in the supply of lead and zinc, but the supply of nickel is still very tight. The demand for nickel is at present about 66% higher than the supply. Very little improvement in the supply of selenium is expected this year.

. The U.S. Govt. will license or sell its Patent No. 2,584,816, (Feb. 5, 1952) for an electroplating control system. This system will maintain a constant potential between the cathode and the anode in spite of the various changes in conditions which may occur during the electroplating operation.

. The National Advisory Committee for Aeronautics has released a 12 page report on a new technique for studying corrosion phenomena. The method permits the detection of the presence of currents produced by local cells on the surface of a corroding metal.

. An Austrian engineer recently developed a new method of metal spraying and spray casting which uses supersonic waves. With this system, mixed metal spraying is possible, such as iron and lead, chromium and bismuth, aluminum and cadmium, copper and lead, zinc and lead. This new process is also an improved method of scale or oxidation removal from the surfaces on which the new metal coats are to be applied.

. The Research & Development Board recently released a report called "Symposium on Vapor Deposition of Metals". A photostatic copy costs $10.00.

. The relaxing of controls is partly due to the fact that the military budget has been scaled down from $85 billion to $50 billion for the fiscal year 1953. Another reason is over-estimating by Washington planners.

. The application of Specified Finishes, Inc. of Chicago to operate a production pool, which was filed with the Pooling Section, Office of Small Business, Commerce Department, has been approved by the Attorney General, Federal Trade Commission and the N.P.A.

. The amended Order M-19 has relaxed its control over the usage of cadmium because of the improved supply of this metal. It permits the unrestricted usage of cadmium in items or processes formerly included in the "permitted use" schedules, plus a number of new plated items for aircraft such as electrical connectors, anti-friction bearings, pulleys, rod-ends, universal joints, and electric and fluid de-icing equipment.

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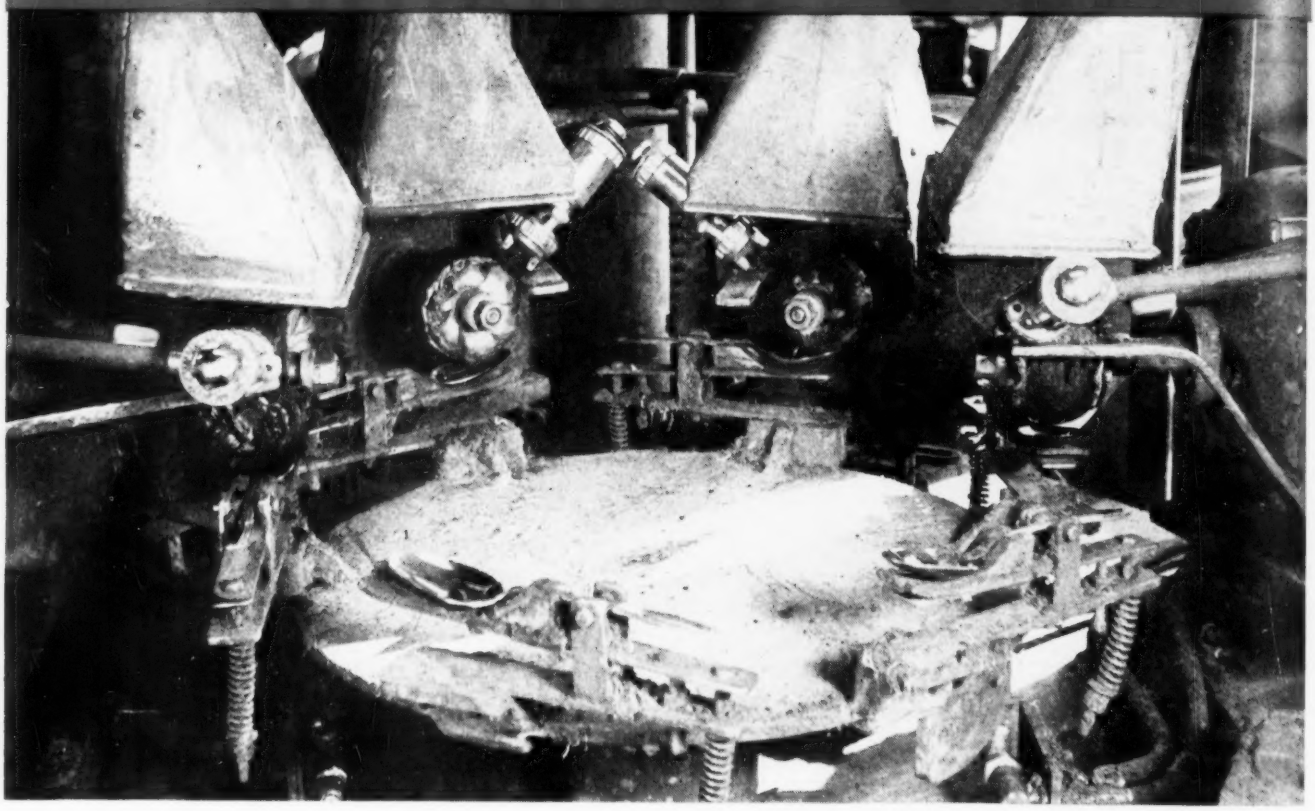

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METAL FINISHING

LUME 50 • NUMBER 5 • MAY 1952

A Gap To Fill

Anyone who has followed closely the activities and developments in the organic finishing field in recent years is cognizant of two unmistakeable facts: 1) the organic finishing field has definitely come of age, and 2) there is now a crying need for an active educational organization through which the ever-increasing complexities of this field can be discussed and explained, an organization which would provide a "cracker barrel" atmosphere in which the industry's operators and technical men could trade experiences and know-how.

Today there exists no national organization concerned with the *application* side of the organic finishing field. While it is true that such excellent organizations as the American Electroplaters' Society and the Federation of Paint and Varnish Production Clubs often sponsor special sessions on the application phases of organic finishes, the primary interests of both of these groups necessarily lie in a different direction. The result is that there is no sustained program of interest to the users of industrial finishes.

There is no doubt that the tremendous advances made in organic finishing in recent years, not only in materials, but also in equipment and procedures, now calls for enlightened, well-trained technical management. The very commendable job done by both the above organizations can be cited as examples of the type of medium now required for the proper advancement of the organic finishing field. No longer is a knowledge of how to dismantle and clean a spray gun sufficient background for intelligent, efficient operation in this field! Its position approximates that of the plating industry 25 years ago.

There was never a more opportune time to form an educational organization concerned with the problems in using organic finishes. Perhaps it could be started as a division of one of the above-mentioned organizations, until such time as it could be self-sustaining. We believe there is sufficient interest to foresee such a possibility. The Institute of Metal Finishing (London), formerly the Electrodepositors Technical Society, recently recognized the need of industry for just such a division covering organic finishing practices as a separate activity from its plating activities. A similar move would seem to be in order here.

It has to start somewhere, and it would be hard to find a more worthwhile and essential broadening of activities for either group.

W. A. Raymond

Editor

Profitable Chromate Wastes

By C. F. Paulson, *Research Dept., The Permutit Co., New York, N. Y.*

Mr. Paulson has been with The Permutit Co. since 1947 working on applications of ion exchange materials and techniques in fields other than water treatment. He attended Princeton Univ., receiving a Bachelor's degree in Chemical Engineering in 1944 and an M.S. in 1947. During the war he served in the Navy as an electronics officer. He is a member of the American Institute of Chemical Engineers and the American Chemical Society, and is the author of several papers on the removal of metals from acid solutions by ion exchange.

THE chromate wastes from anodizing, electroplating, bright dipping, etc. have always been an expensive nuisance. Recently, with more attention being focused upon stream pollution, a variety of disposal methods have been considered and installed. This article will discuss a process operating on a commercial scale which eliminates stream pollution and returns the chromate in usable form to the treatment tank.

Although chromic acid or sodium dichromate are utilized in a variety of metal treating processes, almost all of these processes have two common characteristics:

1. There is a metal buildup in the chromate tank, and
2. There is a loss by dragout of chromate.

During the treatment, the chromate reacts with the metal surface, dissolving some of the metal and producing trivalent chromium from the hexavalent form. For several processes such as bright dipping or copper stripping this is necessary, but for other operations such as electroplating it is an unnecessary side reaction to the process. But in all processes, it results in consumption of the acid and produces a solution containing a metallic chromium salt which eventually cannot be used further. This solution is generally concentrated, toxic and most difficult to dispose of. The methods applied for disposal are: (a) reduction with copperas, sulfur dioxide or other reducing agent, followed by neutralization and precipitation; (b) neutralization with barium sulfide to form an insoluble precipitate; (c) the "porous pot" electrolytic regeneration process; or (d) return of the solution to the manufacturer for reworking. The first two of these result in a complete loss of the chromate values; the "porous pot" method is messy and merely results in complete regeneration of a portion of the solution at the expense of loss of the remainder, which still must be sent to waste. The last method (d) is the only one which results in conservation of the chromate, but it also generally is unattractive because of high freight costs on the aqueous solution and the low price the chromate manufacturer can afford to pay.

A second common source of chromate waste is the rinse solutions in which the dragged-out chromate is washed from the surface of the work. The result is a dilute solution which, while still toxic, particularly since fairly large volumes are involved, does not contain enough chromate to make conventional recovery methods attractive. The first two methods of disposal mentioned in the previous paragraph are generally applied to these dilute wastes, but large holding tanks are expensive, and the disposal cost frequently is comparable to the value of the chromate.

Various countercurrent rinse arrangements have been made to simplify the rinse disposal problem. Where space is available, the most satisfactory flow plan involves the use of a non-flowing "save rinse" tank following the treatment tank, and one or preferably more countercurrent flowing rinses. The contents of the "save rinse" tank are used to make up for dragout and evaporation losses from the treatment tank. In some cases an evaporator is installed in the rinsing layout to keep the solution volume in the cycle to a usable level.

Probably the only advantage of the dragout of chromate from the treatment tanks, and one which has generally been overlooked in installing rinse recovery or chromate recovery processes, is that the dragout controls the buildup of extraneous materials in the treatment tank, such as sulfates or trivalent chromium in electroplating tanks, to non-objectionable levels. When all the dragout is eventually returned to the treatment tank, this advantage disappears and other methods of reducing contamination must be resorted to. The buildup of cationic metals is particularly serious as it reduces the plating efficiency.

Ion Exchange Process

A recovery technique which can be employed is ion exchange. This is a process by which one ion in solution is exchanged for another. The most familiar example of this technique is water "softening," in which sodium ions in the resin are exchanged for calcium ions in the hard water. In the case of chromate solutions the desirable exchange is hydrogen ions for metallic cations.

Numerous attempts have been made to apply ion exchange to the chromate recovery process. Until recently these had been unsuccessful because of insuffi-

cient resistance to oxidation of the ion exchangers then available. There are now several cation exchangers and at least one anion exchanger stable toward chromic acid.

Ion Exchanger Operation At Anodizing Plant

A leading aircraft manufacturer on the East Coast has installed the first complete chromate recovery ion exchanger on an anodizing line. This is operating successfully and producing striking savings. The anodizing bath is operated at a pH between 0.7 and 0.9 and 50-70 grams per liter of CrO_3. Each day a portion of the bath is withdrawn and passed through a bed of a high-capacity cation exchanger. All of the aluminum and other metallic cations are removed from this portion and hydrogen cations substituted. The effluent solution has a very low pH. This effluent is then returned and mixed with the remainder of the chrome bath, lowering the overall metallic content and pH somewhat. Anodizing is not interfered with in any way and can be continued during the treatment. The cation exchange unit was sized so that operation once per day is sufficient to maintain the metals at a reasonable level. Experience has shown that the pH in the bath can be maintained within very close limits and that very little CrO_3 must be added. As the permissible metallic concentration is high in the anodizing tank, it is only necessary to remove and treat a small fraction of the total bath in order to maintain a satisfactory metal concentration. Thus the treatment cycle is short, commonly taking less than one hour.

When the ion exchange resin becomes exhausted, it is regenerated by contacting it with sulfuric acid. The effluent sulfuric acid is sent to waste, carrying with it the metallic cations. This acid is then washed from the unit with water. It is necessary also to displace the chromic acid with water and this results in some desirable dilution which compensates for dragout and evaporation losses of the bath.

Use in Electroplating

This cation exchange recovery process is best incorporated in plating lines where a "save rinse" conservation tank follows the plating tank, as the use of such a save rinse tank, from which chromic acid is returned to the plating tank to compensate for dragout and evaporation losses, is the *first* step in any conservation program. This return generally results in metallic buildup in the plating tank. Also, the ion exchange resin operates very well at the chromic acid concentrations prevailing in the "save rinse" tank, but cannot operate successfully in a 50 oz. per gallon chromic acid solution. So, before the "save rinse" solution is returned to the plating tank, it is passed through the resin to remove all of the metals. This maintains the metal concentration at a sufficiently low level in the plating tank. In some cases, it is necessary to incorporate a small evaporator to raise the concentration from the range of 5 to 50 oz. per gallon.

For other than electroplating and some bright dipping processes, the concentration of chromic acid is much lower than 50 oz. per gallon and it is possible to remove metals directly from the treatment tank by ion exchange. Anodizing, stripping, pickling and sealing processes are in this latter category. However, even in these processes, the incorporation of a "save rinse" tank is desirable and economical.

Anion Exchange Treatment of Rinse Water

The incorporation of a "save rinse" tank will normally conserve from 60 to 90% of the chromate being dragged from the treatment tank. The remaining chromate is still troublesome and requires treatment as described earlier. Ion exchange offers a very satisfactory solution here as well. Instead of sending the rinse water to treatment and thence to waste, it can be sent through a bed of an anion exchanger which has the property of removing the chromate ions from solution and substituting hydroxyl ions. On the treatment of virtually pure chromic acid, this results in the formation of water in place of the acid. Since the equipment is also capable of operating as a water demineralizer, the rinse tank is initially made up with demineralized water. Hence, when the chromic acid is removed, the water is once again demineralized, and can be returned to the rinse tank for re-use. This conserves on the water, and in some cases, where hot rinses are used, on the heat in the water, and simultaneously offers the manifold advantages of demineralized water for rinsing. In practice, the flow rate of treatment may be controlled so that the pH of the rinse tank may be kept at the pH which gives the most satisfactory surface.

When the resin becomes exhausted with chromate, the flow is either halted or shifted to an alternate unit, and the resin is regenerated with caustic soda. The caustic soda drives out the chromate anions and replaces them with hydroxyl anions. The effluent solution from the unit is an alkaline solution containing all of the chromate. In some cases, this solution may be used in the plating shop or fortified with additional chromic

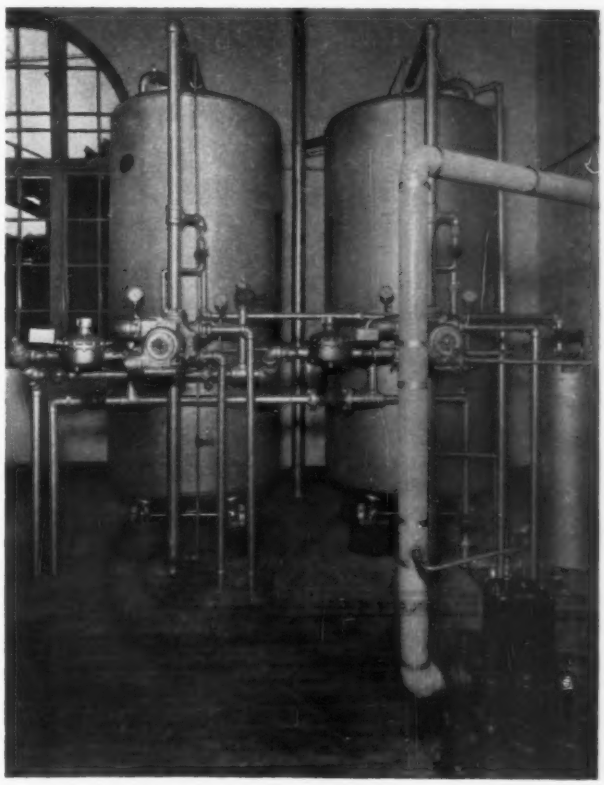


Figure 1. Typical ion exchange installation as described in this article for treating and recovering chromic acid.

acid. In many cases, it is necessary to use the free acid. For this, it is only necessary to pass the alkaline regenerant effluent solution from the anion exchanger through the cation exchanger. Here the sodium ions are removed, forming free chromic acid. This solution can be returned directly to most anodizing and stripping baths, but for return to a plating bath, some evaporation may be necessary.

Figure 1 shows how an installation actually looks. To the left is the cation exchange unit, then the anion exchange unit. The two ion exchange units are of identical construction and are of corrosion resistant materials throughout. The solutions to be treated are introduced by the iron pumps and the regenerant solutions are made up in corrosion resistant tanks. The piping is all resistant to chromic acid.

Cost Savings

The size of the cation exchange unit is such that, operating one cycle per day, it removes aluminum at the rate at which it is dissolved. This amounts to about eight pounds of aluminum and also a small amount of chromium cation. Records kept of the chemical consumption of the bath under present circumstances as compared to similar figures before the recovery equipment was installed, indicate that the equipment results in savings of more than 100 lbs. per day of chromic acid. Heat and water are conserved also and, less the cost of re-pumping the water, amount to about $4.00 per day. A conventional treatment plant for holding, reduction of chromate, and neutralization would cost several times the price of recovery equipment and would have an operating cost for chemicals in excess of $20.00 per day plus the cost of an operator. The recovery equipment may be installed right in the plating room and operated by the plating personnel so that no labor cost is involved.

The operating cost of the recovery equipment at the

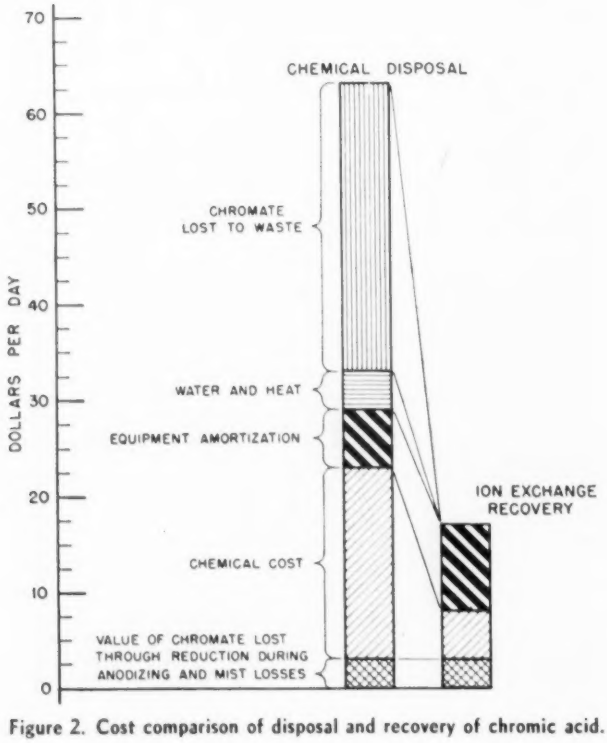


Figure 2. Cost comparison of disposal and recovery of chromic acid.

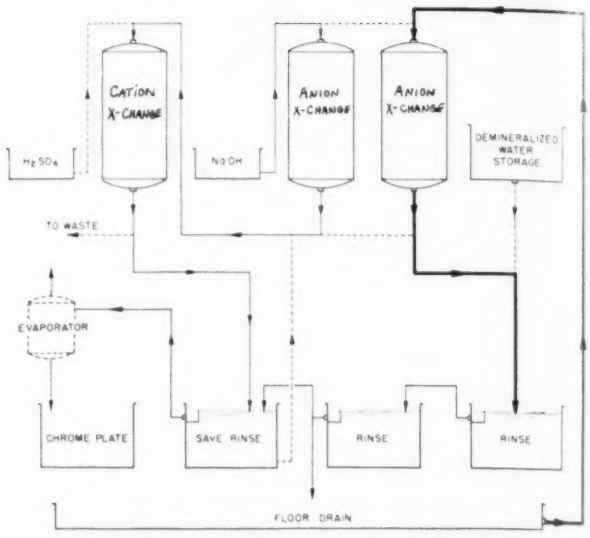


Figure 3. Chromate recovery equipment.

aircraft manufacturer is approximately $14.00 per day including regenerant chemicals, equipment amortization and estimated resin replacement. The resin replacement can only be estimated as there has been no need for replacement as yet. The estimated cost balance is shown in Figure II.

Two important advantages of this recovery equipment which are hard to evaluate in terms of dollars and cents have been noted. The closer control over operating conditions and increased purity of solutions has resulted in increased salt spray resistance of the treated work. Also, the constant CrO_3 content and closely controlled pH resulted in more efficient electrical operation in the anodizing bath.

Since recovery equipment is small and may generally be placed inside the plating room, and disposal equipment is generally installed in a separate house, the building costs for recovery equipment are generally well below those for disposal.

The recovery equipment may also be used as a water demineralizer. Thus it can be used to provide water to make up the various baths. This simplifies very materially the control of sulfates in chrome plating baths and the control of alkalinity in cyanide baths, etc.

Other Applications

A modification of the anion exchange recovery equipment proves useful for small operations where complicated and relatively expensive equipment is not attractive. Rather than install a large storage and treatment tank and cumbersome treatment schedule, a small anion exchanger can be used to concentrate the small quantity of chromate and then the unit can be regenerated with alkali to produce a few gallons of effluent which can be readily treated by reduction with copperas, sulfur dioxide, etc. An increase of concentration of 200-1000 times can be achieved so that treatment is simple in a small batch.

Shown in Figure III is an illustration of the most satisfactory layout of equipment in a plating room for chromate recovery. The flow of work is from the plating tank to the "save rinse" tank and then to two

(*Concluded on page* 56)

People and Industry

By **Harold Silman,** *President, Institute of Metal Finishing, (British) London, Eng.*

The following remarks form a part of the Presidential Address delivered to his Society (formerly the Electrodepositors Technical Society) recently by Mr. Silman. His keen analysis of the basic issues affecting the plating industry apply equally well to American practice in most cases, and point the way towards a better metal finishing industry in both countries. His witty style makes entertaining reading as well.—Ed.

THIS Society, in the course of its diversified technical activities, gives its main attention to the discussion of industrial processes, their advantages and defects, and the means by which they can be made more foolproof and easier to operate.

We tend, however, to make only passing reference to the human aspect of industry, the importance of which is still consistently underrated and only partially understood.

Authors of technical papers tend to take a poor view of people in industry; usually, the designer of a machine is only satisfied if he has a mechanism which will work with the lowest grade of operator, just as he might say it would work on the lowest grade of fuel. If no skill, no strength, and no intelligence are needed to operate it, then the engineer considers he has achieved a high level of success indeed. This attitude, necessary though it may be in many cases, can have far-reaching consequences.

Sometimes the author of a technical dissertation will introduce people into his remarks, referring disparagingly to what is called the "human element." What he has in mind is simply people — people who do the wrong thing, not as a result of circumstances beyond control, like a defective motor or a switch, but either deliberately or through not exercising the intelligence which no one thought they needed to have in the first instance, but which they should have developed and brought into action at a moment's notice in an emergency.

There are other disturbing characteristics attached to the human element. It has to stop work at frequent intervals, it cannot or will not work in poisonous fumes, and must be started by being spoken to nicely instead of by pushing a button. In other words, it is an intolerable nuisance and must be eliminated wherever possible; certainly no self-respecting author of a technical paper would ever give the human factor more than a passing acknowledgment in his dissertation. I have always been interested in the influence of human nature on technology, and in this address it is my intention to say something about this all-important subject. I am not concerning myself primarily with employers and employed, but also with all the other people in industry who have to work together, such as salesmen with buyers, chemists with foremen, and managers with typists. On the successful mutual understanding and collaboration of all these does the efficiency of industry depend, just as much as on the technical excellence of the processes employed.

Introducing a New Process

It has been one of my functions for quite a long time to introduce new processes and methods into industry. Most of these processes started by being impracticable, and not a few were impossible, but nevertheless a considerable proportion of them are now in everyday use. One of the things I learned most slowly was that it is not sufficient for a process to be better or cheaper than the one in current use for it to be acceptable. The merit of a development is only one factor in making it desirable to other people. For instance, such questions as who invented the process, which town or country it comes from, and whether the salesman is *persona grata* with the clerk in the customer's reception office may all be relevant considerations. Inventions introduced from outside an organization usually tend to be thought more highly of than those developed within it. Developments sponsored from one part of the country may be regarded with greater suspicion in another than those originating locally. Processes coming from abroad are commonly viewed with special favor, even if only secretly. Those emanating from the United States start with a great advantage: the cordiality with which they are received is often in direct proportion to the size of the organization and perhaps inversely proportional to the technical background of the management.

The successful introduction of a process depends to a considerable extent on human and subjective considerations. This is akin to the "Principle of Indeterminacy" so well known in the realm of physical science, which postulates that the simple introduction of the observer or the measuring instrument can affect a natural phenomenon so that it cannot be automatically assumed that the data obtained are necessarily identical with those existing in the absence of the observing agency.

Likewise it can be said that an assessment of a process can only be made in relation to the people operating it. Thus, it is well known that a particular bright nickel plating process may work perfectly well in organization A, but will be a failure in organization B, on very similar articles and under similar operating

conditions. The latter organization might prefer an alternative process for which organization A would have no use whatever. It then becomes an impossible matter to decide which process is the better one in any absolute sense. Obviously there must be reasons to account for the difference, but these are so complex and compounded so much of an inextricable mixture of technology, psychology and idiosyncracy that it often becomes impracticable to obtain a clear-cut assessment of the situation. My own activities bring me into contact with a number of different manufacturing units within a group. I am therefore often asked which is the better of two or more competitive processes for a particular application. To give an impartial answer is one of the most difficult things imaginable even from an intimate knowledge of the potential user's personnel and facilities. Naturally, vendors of materials and processes are not able to look at things quite so objectively, so that they are prone to assume that if one maker of say, bath-taps, finds their recommendations completely successful and second to none, all other makers of bath-taps should find them so also. If they do not, then they must either be of low intelligence, deliberately obstructive, or heavily bribed by a competitor!

The basic causes of different results are more often than not subjective ones. For instance, as a simple example, it may be that a new process would adversely affect a foreman's bonus if introduced; while he would probably not deliberately obstruct the new method, it can be taken as axiomatic that he will not exert himself unduly to ensure its successful operation.

Transplanting Processes

The transplantation of a process from one factory to another is as delicate an operation as the propagation of a rare and sensitive orchid. Both demand great skill and careful handling or the new organism will not take root and thrive. This is a difficult enough matter when the operation is being carried out in the same town or the same country, but when a process has to be moved overseas the difficulties which beset the intrepid soul who undertakes it are truly immense. This was discovered in the last war when the shadow-factory scheme was started. All drawings, staff and facilities were freely available, yet innumerable difficulties had to be overcome before production flowed smoothly in the new factories. For instance, in certain cases where limits of size were specified, it was found that better results were obtained when they worked closer to the lower limit rather than the higher one. In other instances the reverse might be the case. These points could not all be put down on record, and were the result of years of accumulated "know-how."

A few years ago it was realized in Government circles that productivity in a number of American factories was far higher than that generally prevailing in Europe. What could be simpler then than to send teams of specialists overseas to study the methods employed and to introduce them at home? These teams have done excellent work, and the activities of the Anglo-American Productivity Council have been invaluable to this country. There was, however, one rather unforeseen consequence. When the reports of the teams began to appear, it was apparent that a manufacturing unit could not be treated as a self-contained function operating, as it were, in a vacuum. Many of the factors making for increased productivity in the United States were found to be not technical at all, but sociological, and outside the scope of factory managements. Such things as the availability of unrationed foodstuffs, shopping hours, opportunities for the capital investment, taxation systems, transport and housing were often at least as important as machines and organization in obtaining the observed results. These matters fall within the sphere of government. It is thus seen that if the prevailing conditions are not right in their widest sense the progress of industrial development may be seriously hampered.

Science and Scientists

The introduction of scientific methods and control into the industry is such a relatively recent innovation that the functions and limitations of the scientist are not yet universally understood.

The first thing to remember about the scientific staffs in industry is that they are quite different types of individuals from the classical scientists, in that they are not interested entirely, or even primarily, in the pursuit of knowledge or the search for ultimate truth. Scientists are ordinary people with taxes to pay and even families to support. This means that they must be paid enough to keep them happy and to prevent them going off to a competitor. This is not always appreciated, and I have heard of one executive who reprimanded a chemist for asking for more money on the grounds that a true scientist should not be so interested in mere material rewards! On the other hand, however, scientifically trained people are not generally satisfied if their jobs give them a good financial return and nothing else. They like to work for someone who understands, or pretends to understand, what they are doing and to know that their difficulties and achievements are appreciated. In this respect they are like prima donnas and homely women: they like to be complimented even when they know they their admirer is not being wholly truthful! This brings us to the vexed question of publication. Scientific or technical development work being in the nature of a skill, a sport, or a hobby, gives the most satisfaction to its exponents when they are allowed to talk about it, especially to those with similar interests. This means that if the enthusiasm of the technical worker is to be maintained, he must have reasonable freedom to contribute to the literature on his subject and to join in discussions. This applies equally to the foreman who has developed a new type of jig as well as to the less practical individual who may have thought out a new theory to account for the crystal structure of an electrodeposit. One of the reasons for the truly advanced state of the science of electrodeposition in this country and also in the U.S.A. is the extent to which those engaged in the industry are willing to discuss and publish the results of their findings. To this happy state of affairs the Electrodepositors' Technical Society, through its publications and meetings, has contributed in no small measure.

If there are any employers left who think that freedom of publication (in its widest sense) is of no significance to their scientific staff I would ask them

how long they would remain fishermen, for example, if they were not allowed to discuss the size of their catch or the technique they employed, or whether they would continue to play golf if the club had a rule that anybody holing in one would not be allowed to disclose the fact on pain of expulsion!

The free movement of people within industry to see how others work and overcome their problems is more than desirable because it broadens the practical experience of all concerned. Experience is probably the most painful and least efficient method of acquiring knowledge but it has still not been superseded.

To maintain the virility of an industry I also believe that there should be reasonably frequent movements of technical staffs from one firm to another. This applies especially to younger men. Firms and organizations which do not have an influx of personnel with outside experience, and rely entirely on promotion from within, tend to become unreceptive to new ideas. Unfortunately, present difficulties in the shape of housing and high taxation make it "not worth while" for people to change their jobs unless the inducement is unduly great. It is recognized of course that a high staff turnover makes for inefficiency, but there is a happy medium in this as in everytihng else.

Applied and Pure Research

There is no sure road to success in scientific research. One of the fallacies which seems to be largely a post-war phenomenon is a belief that the scientific future of the world lies in what is often called "applied research." This means the devotion of money and resources to the solution of specific problems by *ad hoc* means rather than by the acquisition of fundamental knowledge. This has led to a touching confidence in the public mind that, provided enough money is spent, any problem can be solved by research. Some credence was lent to this view by the manufacture of the atomic bomb in the U.S.A. during the war through the expenditure of enormous effort and resources. All the essential data and principles on which the production of the bomb was based were, however, known before the war, and had resulted from fundamental work of a scientific nature not directed towards any special practical objective. I should like to enter a plea at the present time for a greater emphasis on the provision of facilities for research into the basic natural phenomena upon which all technological advances depend.

It is also not always realized that the impact of the scientific method on manufacturing operations is little more than a century old. The principles of many industries, from weaving to metalworking, were well established centuries before the days of methodical scientific investigation. Scientific research led to a better understanding of the reason for the use of methods which had been adopted empirically as a result of long experience. This understanding in turn has led to remarkable progress in technique and in productivity, and it is here that applied research comes into its own. Where new industries have come about as a result of scientific research they have usually been in the nature of by-products of fundamental investigations. The basis of the practice of electrodeposition is the work of Faraday who investigated the conditions under which a current decomposes an electrolyte, yet so removed from practical application was Faraday's work that he paid only the scantiest attention to the quality of the deposits of the common metals which he obtained; his main concern was with the quantitative relationships involved in the electrodeposition process. The radio industry was a result of the fundamental work of Clerk Maxwell, Hertz, and others, on electromagnetic waves. It is an interesting speculation to consider, for example, what success would have been achieved if the problem of communicating speech across long distances had been posed as a problem of operational research for military uses in the absence of the fundamental work of Hertz. There is no knowing what hare-brained schemes might have been pursued at the cost of vast sums of money.

It is now more than ever necessary to create conditions in which an enquiring mind can pursue ideas wherever they may lead. Britain has always led the world in fundamental research, and in these days when patronage is almost the sole prerogative of the State, and anything which is not of immediate usefulness is frowned upon as a waste of time and effort, it is vital to maintain freedom of thought and work in the scientific field. Governments should nevertheless bear in mind the answer which *Gladstone* received from *Faraday* when he asked him what was the use of a particularly abstract discovery: "Sir," he replied, "there is every possibility that in the future you may be able to tax it." Even if there is no other justification for the need to acquire useless knowledge as a long-term policy, this should be sufficient.

Supply Houses

Secondary industries, of which electroplating is one, are dependent on supply houses to provide their needs in the forms of materials and processes. The difficulties of supply houses vary from time to time, but they always oscillate between two phases which never attain equilibrium, i.e. too many goods and not enough customers, or the other way round. Their customers expect them to have the wisdom of Solomon in the distribution of scarce commodities and in the solution of all kinds of troubles, the patience of Job in explaining the simple principles of their processes to those who cannot or will not learn, and the wealth of Crœsus in granting long credits during times of depression because there is no trade, and longer credits during times of prosperity to enable them to expand! These selfsame customers are slow to believe that their supply houses possess the first two attributes, but are sure that they have the third.

But supply houses are not immune from human failings themselves. I will content myself here with listing a few in the hope that they may be taken to heart and lead to a greater understanding between them and their customers of their mutual problems and interests. The first is an altogether too great faith in the secret formula and the desire to sell nostrums for every technical ill, thereby making a short-term profit and risking a long-term loss of goodwill. The late *Henry Ford* once said that in business if one provides service in its fullest sense the profits will come automatically. There is much in this theory. Essen-

tially the supply house is usually selling to a busy executive who is looking for trouble-free processes and materials rather than for small price differentials. If his suppliers can so service their products that he can sleep peacefully at night and take an afternoon off for golf occasionally he can be assured of the business for evermore. But if, on the other hand, the vendor does not know the first thing about the peculiarities of his products or is not available to keep them in satisfactory operation, then he is not likely to retain the confidence or the business of his customer for long, however low his prices are. It is no use him fulminating about the customer's poor plant, incompetent staff, and inadequate facilities: the buyer will find it easier to change his supplier instead of all these! More often than not the customer is more than aware of his own limitations, which today may have their origin in circumstances quite outside his control, and he will not be grateful for having them emphasized to him by a supplier. The customer may not always be right, but it is still good business to pander to some extent to his delusion that he is.

Another curious belief on the part of supply houses is that their customers purchase secret chemical mixtures simply because they have failed to discover what is in them. They often really believe that if the buyer were once to fathom the closely guarded secret of the elementary mixtures he would immediately start making the product himself. The only people who are really upset by this delusion are the analytical chemists, who regard the propagation of this myth as a reflection on their professional abilities. It can safely be said that so far as the larger organizations are concerned, at any rate, chemical mixtures are bought: (*a*) because the space, labor and facilities that would have to be provided for making their limited requirements would make the proposition quite uneconomic; (*b*) because of the availability of specialized technical and advisory services from the supplier. If the prices charged are at all reasonable these two points are usually strongly in favor of buying the proprietary mixture.

It would be to the advantage of the industry if manufacturers were less reticent about the compositions of their products. They would then be able to take advantage of the experience of their customers and improve their formula accordingly. In fact, I venture to suggest that if the formula of proprietary cleaners and other chemicals were printed clearly on the labels of their containers it would make little difference to the suppliers' business. In another field, only a few years ago, manufacturers of pharmaceutical and food products protested that their businesses would be ruined if they had to disclose to their customers that their mixtures were composed essentially of two or three simple ingredients. In actual fact, since such disclosure has been made compulsory, nothing of the kind has happened. Apparently it never occurred to the manufacturers that the housewife would not be bothered to mix her own baking powder, for instance, even if she was told on the packet that it consisted of only two simple and easily obtained chemicals. The same considerations apply to an even greater degree to the engineering and related industries.

Plant and Machinery

One of the major weaknesses in industry is often the lack of appreciation of production requirements on the part of the manufacturers of plant for use in factories employing modern flow-production methods. This applies to many industries, electroplating being no exception. It may seem incredible to the uninitiated, but it is a wellknown fact that very many designers and draughtsman have never seen the machines, on the design of which they work, in operation. This explains some of the features of pieces of equipment which make them much less useful than they might be. For example, a small lever which is simple to operate in a comfortable office may prove an intolerable obstacle to production if it has to be used every few minutes during an eight-hour day by a workman standing in an uncomfortable pose and wearing heavy protective clothing. If the lever has to be operated only once in ten minutes it will be equally an obstacle to production because clearly it would occupy an operator full time but would prevent him doing another job. The most expensive commodity used in industry today is time; it pays to spend quite considerable sums of money to save even a little time.

Manufacturers also like to show their equipment at trade exhibitions under particularly favorable conditions; no noxious chemicals fill their tanks and no fumes vitiate the surrounding atmosphere, delicately perfumed by banks of flowers. When their machines do operate (which is seldom) they are made to do so most aseptically by white-overalled assistants with time on their hands. Under these conditions all machines look eminently practical and desirable; it is here, all too often, that many of their designers and also their sellers have their first and last sight of them. Customers also sometimes purchase them under these hypnotic conditions, which is a dangerous thing to do. It would be to the advantage of all concerned if people involved in the design of plant down to those responsible for the smallest items were to spend some time regularly in their customers' factories to study their products in action. The advantage which would accrue would be considerable, and the time so spent would be far from wasted.

Productivity

So much has been said and written about productivity that it is difficult to add anything original to the exhortations and advice which have emanated from all quarters on this debated subject. In my opinion, however, productivity is a state of mind. It flourishes best under conditions of minimum restriction, where the scope for initiative is widest, and where the rewards for success are high. No one can talk about productivity without mentioning the United States which, with only 7% of the world's poulation, is able to produce 30% of the world's goods and services. This is not achieved entirely by hard physical labor or even by long hours of work; it is the product of good organizations, high incentives, competition and unbounded confidence. In this respect the United States has usurped the position occupied by this country some decades ago. Productivity is a cumula-

tive function in that each advance in production provides the means for more production and the incentives in the form of goods and facilities. Conversely a fall in productivity is conducive to further falls and a general depression in the standard of living.

At the back of this country's production difficulties lies the habit into which we have got of attempting to overcome real or anticipated problems by restrictive measures. This applies to all classes of the community. Every further restriction reduces incentive and progressively strangles enterprise. When dockers refuse to permit the installation of mechanical handling equipment the national income from shipping is reduced and exports are affected. Weavers restricting the number of looms they will work and trade unions placing limitations on the type of work a tradesman may do are further examples.

Likewise, restrictions on capital expenditure have kept mechanization in industry to an unduly low level; British industry today is actually less mechanized in proportion to the number of people employed than it was in 1939.

Integrated Production

One cause of low productivity in some factories is lack of detailed attention to the lay-out of production plant to eliminate wasted effort and time. The advantages of the installation of high-speed machines can often be largely nullified if the plant lay-out does not integrate them fully into the system. This is not normally a function of the machine manufacturer, but one which the user must study and work out for himself. For example, it is not uncommon to see a fully mechanized machine being fed with materials toted up to it by crude manual methods involving a large amount of inefficiently utilized labor.

In some branches of industry in this country there is still, surprisingly enough, organized opposition to the installation of modern mechanical handling equipment. Fortunately the engineering industry is not one of these, and neither is our greatest industry, agriculture, which is now the most highly mechanized in the world.

There is one aspect of the introduction of modern plant into industry which merits some thought, and that is the importance of distinguishing between what is merely new and what constitutes an improvement. New methods are not always superior to older ones and as the newer developments are often accompanied by a high degree of sales pressure it is essential that the potential user should be well informed regarding their suitability for his needs. Industry in this country is often criticized for being reluctant to adopt new methods, but there is some danger of being carried to the opposite extreme.

Another tendency which is to be deprecated is the increasing complexity of modern machinery. There are a number of reasons for this, one of which is the fact that high-priced equipment is naturally more remunerative to the vendor than cheaper plant. Furthermore, a high degree of complexity improves the vendor's position in that the customer is less able to improvise something similar himself or even to assess whether the price he is paying for it bears any resemblance to its value. Competitive manufacturers may also find it more difficult to enter the field. These are all human and commercial considerations which play a part in technical developments and it behooves the buyer to be wary.

Increasing complexity leads to increasing risks of running troubles and maintenance difficuties. It is no use saving a number of workers by installing a machine if still more workers have to be employed in servicing and repairing it. In buying a new plant it is important that one should look first for simplicity and flexibility to meet changing requirements and to enquire whether less elaborate equipment will function equally well or better.

Incentives

In any form of industrial activity the problem of incentives looms large. Up till recent years, for the mass of the people at any rate, the necessity for providing incentives did not arise — the impulse to work to avoid sheer starvation was sufficient incentive in itself. Today the situation is different and some other form of incentive becomes essential. In effect, probably the chief positive incentive to work is the desire to enjoy oneself as a result of having the money to do so. The enjoyment may take a variety of forms, some perhaps more aestheic than others, but it is essential that all tastes and needs should be catered for. When a beneficent Government guarantees the necessities even if one is not prepared to work at all, then one works for the luxuries of life. This means that the availability of facilities for the enjoyment of income above the subsistence level will automatically provide the greatest incentive. I have touched on this earlier in this address. There are also disincentive factors, perhaps one of the most serious of which is the decreasing differentiation between skilled and unskilled or semi-skilled work, so far as payment is concerned. In a desire to see that the least well paid workers have enough to maintain a reasonable standard of living every effort is made by Trades Councils, with Government support, to ensure that minimum wages do not fall unduly. This is as it should be. In an effort to keep down costs and so facilitate exports, wages of higher paid workers are not raised accordingly, as it can be argued that the latter are not liable to suffer actual physical hardship. The effect of this, however, is to render the possession of skill progressively less worth while. Systems of remuneration often further adversely affect the skilled worker even if his basic wage is higher, because the differential is more than compensated for by certain piece-work systems in which the semi-skilled worker participates. The direct effect of this is becoming marked in the electrical industry, for example, where it is becoming difficult to find skilled men. To some extent this is being offset by mechanization and other improvements which reduce dependence on skilled workers, but the process is a two-edged weapon inasmuch as the introduction of improved machinery increases the demand for very highly skilled maintenance and other workers to service and keep it at its full efficiency.

In discussions on the subject of incentive little is said about those who hazard their own or their shareholders' capital in the manufacturing industries. I think it is true to say that in terms of real financial

reward such men in this country are probably worse off than those anywhere in the world. This is a product of taxation policy and of periodic restrictive measures which are often arbitrary and unforeseeable and so cannot be provided for. Nevertheless, enterprises are still being initiated by people who know full well that success can be of little or no material personal benefit to them while failure may mean a substantial loss. They do so for many reasons (not all of which are logical), or through force of habit, but the nation reaps the reward. It remains to be seen whether the next generation of "Captains of Industry" will adopt the same attitude. A reduction in what may be termed the national initiative would be a serious matter in the long run.

The whole question of incentive needs closer study than it has had in the past; money is valueless unless it can be spent in worthwhile ways and without unnecessary restriction. At the present time the chief ways in which a (British) worker can freely spend any surplus money he may earn are in gambling, drinking and smoking; in all these activities a large proportion of the expenditure returns to the Government. Opportunities for expenditure on useful things such as more food, better housing, or better amenities are so restricted as to be impracticable. As a recent visitor to this country from the U.S.A. remarked: "The disappointing thing about Britain is that when you get to enjoying yourself you usually run into some depressing regulations."

On Government

Finally, I want to say something about some aspects of government which are not taken into account sufficiently by people interested primarily in the technical side of their work. For the first time in the history of our industry a Government has taken to looking right into our plating tanks and is telling us what solutions we may use and what articles we may or may not plate in them. Bureaucracies of whatever party have two main characteristics. First, they never admit an error of judgment or decision; secondly, the reasons they give for their actions are always related to political needs and not necessarily to the facts. This makes it difficult for technical men to understand how some Government decisions are arrived at. Never have Governments been so well advised on scientific matters as today. The wealth of experience constantly placed at their disposal by industry and by their own departments ensures that when a decision is made which appears questionable it is certainly not made through ignorance of the facts. The recent decision to ban nickel plating on a whole range of articles is a case in point. When the plating industry put forward proposals for affecting a total saving of nickel even greater than would be achieved by the issue of a list of prohibited articles, this was unacceptable to the Government for reasons which can be surmised but which have not been made public, perhaps for good reasons.

Unfortunately, total prohibitions of this type are detrimental to scientific progress and result in a diversion of effort in wrong directions. If, for example, as a result of research, the porosity of nickel deposits could be reduced to enable nickel plating thicknesses to be cut in half for the same durability, this would be a useful achievement. The complete prohibition of nickel, however, makes work on such a project almost pointless. Restrictive legislation of this kind, however necessary it may appear to be at the time, is far-reaching in its frustrating effects on research and on progress and should be avoided if at all possible.

PROFITABLE CHROMATE WASTES

(*Concluded from page* 50)

"flowing rinses" in succession. The flow of rinse water is from the second to the first "flowing rinse" by gravity. It overflows from the first "rinse" into a floor drain system, which is isolated from other plating operations. This floor drain would of course collect also any spillage from the plating or rinse tanks. Splash boards are placed between the tanks to minimize this spillage. A very small flow of water is continuously withdrawn from the "save rinse" tank and returned to the plating tank. An evaporator is shown in dotted lines as concentration of this "save rinse" water may be necessary before it is returned to the plating tank. Water to make up the level in the "save rinse" tank is provided by the overflow from the first rinse tank. The cation exchange unit is installed so that when necessary it can withdraw acid from the "save rinse" tank, remove metallic cations from it, and return the purified acid to the "save rinse" tank. This provides the necessary purification for the plating solution. The dilute acid solution is withdrawn from the floor drain and pumped through one of the anion exchange units. The alternate unit is undergoing regeneration. From the anion exchanger the water is returned to the second rinse tank. When the anion exchanger becomes exhausted, the flow is shifted to the alternate unit and the first unit regenerated. Caustic soda is introduced and flows through the anion exchanger and then the cation exchanger for removal of the sodium. The acid then goes to the "save rinse" tank. A demineralized water storage tank is provided to supply makeup water as needed to the various tanks, and this can be filled at leisure by passing raw water through the ion exchange units.

Summary

A complete system has been developed and described for supplanting chromate disposal facilities and recovering the chromate in useful form. Advantages of the system are:

Lower initial and installation cost.
Lower operating cost.
Smaller space required.
Reduced consumption of strategic materials.
Better plating or anodizing efficiency.
Higher quality finished product.
Reduced water and steam consumption.

The system consists of a cation exchanger to remove metallic cations from the strong chromic acid solution and an anion exchanger to recover the chromate from the dilute rinse solutions.

Clear Lacquers for Plated Parts

The following remarks are based on several papers given at the recent meeting of the British Institute of Metal Finishers and are used with the kind permission of our British counterpart, *Metal Industry*.—ED.

THE paint and varnish industry supplies lacquers for silver plate, brass and copper, in order to overcome tarnish problems, but for obvious reasons requests for similar lacquers for chrome plate are not general.

Since protection from corrosion or decay constitutes one of the main reasons for the existence of the paint and varnish industry, one might expect the problem of the electroplaters to be easy to solve. In fact, their problem is not so easy. Normally when one wishes to paint a surface such as steel, to prevent its subsequent corrosion, manufacturers are able to supply pigmented products. The use of such products is obviously impossible in the present case, for we want to retain the high metallic lustre of the chrome. By eliminating those colored pigments the whole mechanism of protection changed and became more difficult.

Without the ability to use pigments chrome plate can only be protected by the provision of a physical barrier to the moisture. Corrosion, of course, can only occur when water reaches the metal surface.

The lacquer manufacturer had to find a formula which provided a lacquer having the highest barrier to water in liquid or vapor form, together with maximum hardness and adhesion so as to resist mechanical damage. There are, however, many other properties required in a lacquer, so before considering its composition it would be as well to list the required properties. They fall under two main heads: (1) Properties of the film itself, and (2) Process requirements.

Under section one comes resistance to liquid water; resistance to water vapor; adhesion to metal; hardness and toughness, i.e. abrasion resistance; flexibility; color and transparency, and specular reflection; resistance to oil and gasoline, resistance to cleaning compounds and polishes; resistance to fruit juices and fats, and heat resistance.

Those properties are required not only in the newly-applied lacquer film but also have to be retained as far as possible in the weathered or aged film.

Requirements under section two are number of coats of lacquer required to give the desired degree of protection; speed of application; processing times and temperatures; degree of tolerance allowable in the above factors; capital cost of plant involved; cost per unit of production, and impact of fire restrictions on storage and use.

While those lists are not intended to be exhaustive they did indicate the size of the problem which faces the manufacturer and user.

Since the listed properties can not possibly all exist to a maximum degree in any one lacquer, certain of them have to be sacrificed to some extent that the more important might be kept at the highest possible level. Different uses would put emphasis on different properties and a whole range of lacquers for dipping or spraying, for baking or air drying would be in demand.

To illustrate the point, take the case of a car bumper bar and compare it with the grab handle on a refrigerator. On the bumper bar color stability in ultra-violet light was important and resistance to fruit juice was not. For the refrigerator handle the reverse was the case.

Or again, adhesion was more important on a bicycle bell than on a clock case. Adhesion, also, was a reminder of a major difference between the paint manufacturer's normal problem and the present one. Most surfaces to be lacquered are relatively rough or porous and the provision of adhesion was not difficult, due to the mechanical key which existed between lacquer and surface. Chrome plate is very highly polished, and the mechanical key was practically zero.

They had, therefore, to rely on the physico-chemical affinity of the lacquer for the chrome surface. That implied that the surface had to be scrupulously clean at the time the lacquer was applied. It must not be contaminated by moisture, finger deposits, or by the atmosphere.

The need for different qualities in any one lacquer has already been referred to. How great that variety could be was well illustrated by considering, say, a baking lacquer. First, either one or two coats might be applied, and each coat might be of high or low film thickness; it might be baked at a high temperature for a few minutes, or for a much longer time at a lower temperature; it might, and often did receive its heat conversion in an oven where the temperature as between one part and another might vary by as much as 50 per cent. Conveyor lines might break down, lunch time whistles blow, or power cuts occur, all leading to over or under stoving and a consequent alteration of properties in the film. Over-stoving might give better resistance to chemicals, but poor color.

Lacquer films, like plate, seldom exist without some discontinuities, known generally as "pinholing." These might be due to the lacquer or its application. Whatever the cause, the use of two coats made it highly unlikely that two such defects would be superimposed, and localized corrosion, due to water reaching the metal surface through a pinhole, would be considerably reduced.

All lacquer films, however, can absorb water and also allow water to permeate them. A fully baked film would absorb less water than a partially or an over baked one, and a thick film was a better barrier than a thin one. Some lacquers absorb water and whiten, often regain-

ing their transparency as the water dries out, while others, including the cellulose lacquers, absorb very little water and do not whiten on immersion but are nevertheless highly permeable to water vapor.

The properties of color, transparency and specular reflection need explanation. It is a requirement that the lacquer film be as invisible as possible and have the minimum amount of effect on the color of the article. That is almost impossible to meet fully.

Light striking the chrome surface undergoes specular reflection with no refraction and very little scattering. With a lacquered surface, however, there is scattering and refraction. In the case of the lacquered surface incident light twice traverses the film and in the process is scattered both in the film and from the surface. Scattering in the film is caused by the light striking sub-microscopic particles while on the surface. The waviness due to the shrinkage of the film when drying and the chemical changes during the curing was responsible for a large amount of scatter. Those two factors could reduce reflection to 75 per cent of its original figure from an untreated surface.

Cellulose lacquers are widely used for the protection of silver plate and decorative brassware. For that purpose, high viscosity nitrocellulose plus a little plasticizer and resin are used. Because high viscosity cotton was used the solid content of the clear lacquer was very low, often only 5-10 per cent. The film was of corresponding thinness and did not much disturb the optical surface of the electroplate or modify its color, but the film was so thin that it could not withstand hand friction and still less the abrasive effect of polishes. It was, also, not thick enough to act as an efficient water barrier and its adhesion was rapidly lost under humid conditions. That type of lacquer was only of use for objects inside the home or office.

By modifying those lacquers by the use of nitrocellulose-synthetic resin blends they obtained lacquers of a higher solid content—from 15-20 per cent and the deposited films were pale in color, though not as colorless as the first type. Film hardness was excellent, but the initial adhesion was not as great as that of baking synthetic lacquers, and in contact with water the original adhesion was considerably reduced. The exterior durability of those lacquers was inferior to the pigmented cellulose lacquers so extensively used on car body work. Such cellulose-synthetic lacquers would probably find their greatest use under heavy duty interior conditions. In the workshop they made possible the use of rapid finishing schedules and removed the need for baking ovens, air conditioning, etc. They are suitable for application by brush, spray or dip processes.

Orthodox types of varnish based on linseed oil and natural resin such as Congo Copal, are unlikely to be of interest since they all have considerable depth of color. At one time that class of varnish was widely used on brass bedsteads and similar articles, for apart from color the films gave good resistance to most hazards.

Alkyd varnishes were the successors to Congo varnish and were made with phthalic anhydride as the resin-forming ingredient. While linseed oil derivatives were frequently employed in their manufacture, other paler vegetable oils, such as castor oil and soya bean oil, were frequently used. All members of that class were noted for their resistance to external weathering. While air drying types were widely used, there were baking varnishes, baking times being of the order of a half hour at 280°F.

By blending alkyd resins with urea or melamine resins the baking time could be greatly reduced, and the use of infra-red baking enabled baking times to be cut to a few minutes. The introduction of amino resins provided films of considerably increased hardness, but after a certain point there was a decrease in exterior durability. Resistance to oils, greases and abrasives would be high; resistance to continual condensation or high humidity while high, might not meet all specifications. Nearly all members gave films of excellent color.

An interesting development was the use of alkyd resins combined chemically with styrene. For many purposes the corresponding lacquers were found to have considerable advantages over the normal alkyd resins. The styrenated-alkyd resins produced air drying lacquers which dried in a few hours to give hard, firmly adherent coatings which would replace nitrocellulose lacquers for many purposes. High quality finishes required a considerable capital outlay on baking ovens and air conditioning plant. Application might be by spraying or dipping. That type of varnish would undoubtedly be the best to use for chrome plate.

Another type of synthetic resin coming to general use is based on chemical derivatives of acetylene and known chemically as vinyl resins. They are exceptionally pale in color, possess good durability and resistance to chemicals. Their drawbacks are price and availability, and they need high temperature baking if maximum performance is to be secured.

Clear Lacquers

Clear lacquers were applied to polished or plated and polished metals to protect the surface from tarnishing or corrosion, so that the original bright mirror finish might be maintained.

The lacquer film had to have good intrinsic lightfastness and there had to be no reaction between the coating and the metal. The adhesion of the finish had to be good and its corrosion resistance adequate. Those properties would vary not only with the formulation of the lacquer, but with the metal on which it was to be used and with the exposure conditions. Interior finishes were usually formulated to give a thin coating and so retain the brilliant mirror finish of the metal to the maximum degree. For exterior exposure, heavier or multiple coatings were used to obtain maximum corrosion resistance.

Maximum abrasion resistance was required in coatings which had to withstand constant handling and rubbing, or which had to be periodically cleaned, particularly where such cleaning would involve abrasive action by collected dirt.

The highest qualities of flexibility and adhesion were required in finishes for metal which was sheared, stamped or embossed after lacquering.

Lacquers varied greatly in polishing properties. Unfortunately several types of finish with excellent corrosion resistance, lightfastness and adhesion had to be rejected if the finished article was to be buff polished. Many lacquers which would be softened by the heat

developed with the high speed polishing buff might be hand polished. Lacquers suitable for use on one metal might be quite unsuitable for others, even under the same conditions.

Shortage of brass and copper sheet for the production of ornaments, holloware and other articles had given rise to their manufacture from sheet iron, afterwards brass or copper plated. While lacquering was always important in that industry, the coating had now to be of a permanent rather than a temporary nature. Whereas the consumer would eventually polish off a thin lacquer coating and polish the brass itself, similar treatment would now soon expose the base metal. Apart from that the commercial deposits of brass and copper tended to be porous, so that the lacquering problem became, to some extent, that of the protection of iron from corrosion. A corrosion and abrasion resistant lacquer was required.

Similar type of clear finishes might be used on brass, copper, nickel, silver and tin, except that in the case of silver the finish had to be carefully selected for lightfastness and should be free of traces of sulphur and other impurities. The period during which the coating would give good protection on exterior exposure would also vary. Copper, for example, would often prove easier to protect for a long period on outside exposure than would brass.

Those metals might be finished for interior or exterior work either in cellulose lacquers or in air drying or baking clears based on some of the recently developed high-polymer resins. Short baking plasticized amino resin finishes gave tough interior finishes with good adhesion, while for outside exposure the drying-oils alkyds hardened with amino resins gave better weathering properties and water resistance, but lower adhesion, toughness and lightfastness.

On zinc, the air drying or baked finishes based on certain vinyl and other high-polymer resins were again very good for interior or exterior use, and plasticized amino resin short-baking clears were good under interior conditions. Specially-formulated nitrocellulose finishes were also very satisfactory.

Cadmium plate was more difficult to lacquer satisfactorily. Baked vinyl and other similar lacquers were used successfully and it was probable that baked clears based on epoxy resins and used with cross-linking agents would be found to give good results.

Until recently the lacquering of chromium plate had no merit, since chromium properly deposited over a good, non-porous deposit of nickel and copper gave excellent protection against corrosion and did not tarnish. The present shortage of nickel has led to the deposition of chromium direct on to copper plated iron, giving a system with low corrosion resistance. The process was, therefore, used mainly as a decorative treatment, protection against rusting and corrosion being obtained by the final lacquer coating. The adhesion of all standard types of lacquer to polished chrome was poor, but could be much improved by pretreatment of the metal. Following such treatment a few lacquers gave a finish which was acceptable for exterior durability.

A finish based on a recently produced epoxy resin, blended with a cross-linking agent before application, gave a good finish when baked at 350°F. It was hard, abrasion resistant and did not discolor badly unless overbaked.

It had been claimed that melamine-alkyd finishes of a special type were suitable for that work. When baked for 30 min. at 260°F. a finish of fairly good durability was obtained, but the water resistance tended to be rather low.

Air dried or short-baked finishes based on certain synthetic resins used either alone or in combination with nitrocellulose gave finishes with good weather resistance on chromium plate. They were tough and lightfast, but slightly soft unless baked.

For interior work the short-baked, plasticized aminoresin lacquers were quite acceptable.

It was essential that metal surfaces should be thoroughly degreased and cleaned before lacquering, and polishing "compo" had to be removed.

The final polishing should be done with dry polish such as Sheffield Lime to remove all traces of polishing "compo," and should be followed where possible by solvent degreasing.

Polished chromium plate should be given the final polish with dry lime, and a further pre-treatment before lacquering.

Immersion of the metal for a period of up to 4 min. in a 2 per cent solution of chromium trioxide at about 160°F. gave good results. Alternatively, a short immersion in an electrolytic cleaner had proved very satisfactory. In either case the process was followed by a water rinse. It had a negligible effect on the brilliance of the plating and increased the adhesion of lacquer very greatly.

Special solutions were available for the cleaning and pre-treatment of zinc and other metals.

An extremely wide range of air drying and baking lacquers is now available. Cellulose finishes alone might be of many different types, some containing only a trace of cellulose and yet coming under the regulations relating to the use of cellulose solutions.

Many manufacturers evaluated a number of finishes before deciding on their finishing process. There is a tendency to take short cuts and to use so-called accelerated tests, which are attractive but misleading.

Corrosion resistance tests also should be such that they could be correlated with the conditions to be met with in practice.

The "salt spray" test was a typical example. Some lacquers which withstood that test for long periods broke down rapidly on exposure to normal weathering. Other finishes were broken down more rapidly with clean distilled water in the same apparatus!

Humidity cabinet tests might be equally misleading. Lacquers which would protect, for example, polished brass for a period of two years or more, could be broken down in a day or two under certain humidity tests, and the reverse might hold true.

Whenever possible, lacquers for test should be applied as they would be in production, and tested for durability under the conditions that the lacquered article would have to meet when in use.

It was often most instructive to examine the lacquer films on articles lacquered during production, for con-

(*Concluded on page* 101)

Figure 1. Straight from the foundry come hundreds of skillets piled in wooden hand-trucks. Here they are shown being placed in batteries of tumbling mills, operating with a terrific din. Upwards of a hundred skillets (they vary in size, of course), are loaded into a mill. Thousands of cast iron "jacks" in the mill dash against the iron surfaces as the mill rotates for some 20 to 30 minutes.

Finishing Cast Iron Skillets

By Walter Rudolph, *Erie, Pa.*

ONE of the country's "traditional" metalworking firms, *Griswold Manufacturing Co.* on W. 12th St., Erie, Pa., began in 1865 to make cast iron hardware, and more recently expanded operations to include sheet metal fabrication of an extensive line of commercial and household cooking equipment. But one of its "firsts," the making of cast iron cooking utensils, still holds a proud, and large place in the firm's business. Naturally the finishing of such ware, often called hollowware, or skillets, has been developed to a fine mass production process, as can be seen in the accompanying pictures of their operations.

Figure 2. Skillets are next routed, dull and very finely pitted from the milling tumblers, to rows of grinding machines for removal of sprues on edges. Gateing used to be done on the sides, but is now on a skillet lip or upper edge. Grinding wheel is 24 grit. Good exhausting duct work will be seen throughout the plant.

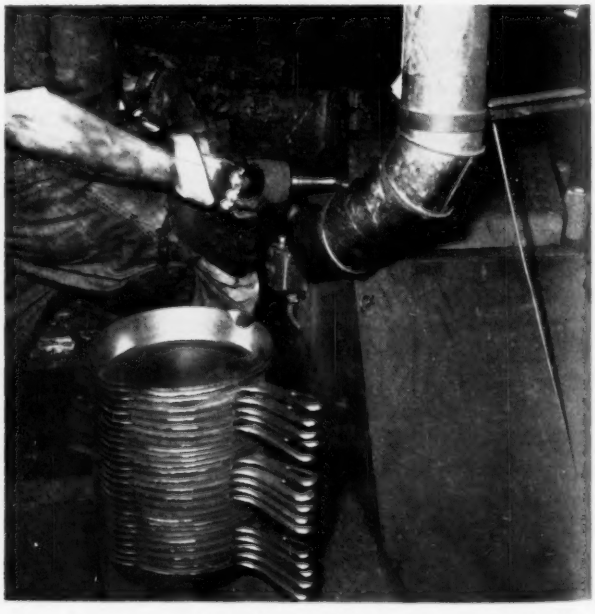


Figure 3. Second grinding is of lip bulge (pouring edge). Now we see grinding wheels that are made right at Griswold, for economical and availability reasons. This particular small wheel is a mixture of 24 and 36 grit. Note knee pad to bring quick, hard pressure on lip grinding.

Figure 4. After lip grinding, skillets go to the "automatics," one of which is seen being loaded here, where the inside areas are finish ground. One man runs as many as six of these machines, depending upon skillet size. The wheel is generally about #36 stone grit.

Figure 5. Here a smaller skillet (Griswold produces some 175,000 skillets monthly, 3 to 20 sizes, as they are termed; has produced 100,000 of one size in three months) is shown on a set-up wheel grinding operation; four-pronged lever is used to force wheel against skillet sides.

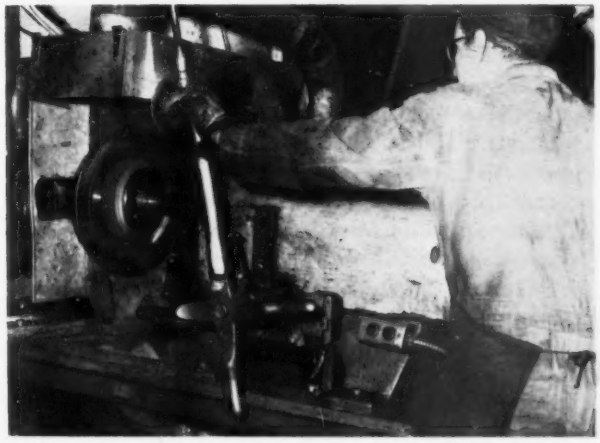


Figure 6. Set-up wheels, or those made at Griswold, can be used for some 75 to 80 pieces of ware (36 grit), and then are removed from rough grinding and retained for a similar number of "finish" polishings. Used, loosened grit is reclaimed below machine.

Figure 7. Final polishing of handle and top edge of skillet (here griddle-type ware is shown), is done on wheels 14-inches in diameter, also built up and using 120 grit. About 400 pieces can be worked with one wheel, before rebuilding.

Figure 8. Griswold makes up all its own polishing wheels in its wheel-building department. Here a workman is applying the abrasive "head" to a wheel by rolling it in a pan of accurately-sized polishing grit, having first applied a heavy coating of warm glue to hold the grain in place. After this the wheels are dried and aged before using.

Figure 9. Finally, skillets are hung onto a 40-foot conveyor which travels to left in this view, makes a cycle in 7½ minutes from time worker on left hangs them on, until removal and labeling, right. On trip they go through heating tunnel and are slightly warmed before receiving a thin, protective coating of sprayed "lacquer-wax" to prevent rusting during shipment and storage.

Health Hazards in Electroplating Plants

By H. M. L. Murray, *Senior Medical Officer, Australian Paper Manufacturers, Melbourne, Australia*

WHEN asked to prepare this paper, my first thought was that it would be difficult to write more than a very few words on this subject. On the spur of the moment, the only health hazard in the plating industry that I could think of was the risk of dermatitis and nasal irritation from chrome plating. However when I really looked into the subject I found that the boot was on the other foot; there is an embarrassing quantity of material to choose from!

Electroplating includes the preparation of the article to be plated, the actual deposition of metal by electrolysis, and various finishing processes. The health hazards of these three groups of operations differ considerably, one from another; and therefore I propose to consider each separately, in turn.

Preliminary Preparation

The preliminary preparation of the article to be plated entails some form of treatment designed to present a suitable surface for the deposition of metal. This may be done in one or more of several ways, which includes blasting or grinding, the use of various acid or alkaline baths, and the removal of grease by organic solvents. Once again each of these sub-groups represents an entirely different health hazard.

Dusts

The risk from blasting or grinding is essentially a risk from dust; the dust enters the body by inhalation. In general, we can divide dusts into three classes: (a) those which are harmful, because they have some specific action on the lungs; e.f. silica; (b) those which are absorbed into the blood, and carried thereby to various parts of the body, where they may produce some harmful effect—e.g. T.N.T.; and (c) those which may have a nuisance value but do not produce either permanent local damage or systemic poisoning. As far as we know, there are only four members of the first group; they are silica, asbestos, cotton and coal; obviously the only one of these which need concern us is silica.

I think it is worth while stopping at this stage for a moment, to consider what happens when dust is inhaled. We breathe in air through the nose, or the mouth; it passes into the throat, then into the windpipe, which in the upper part of the chest divides into two bronchi, one running to each lung. These bronchi in turn divide and subdivide, in very much the same way as does the branch of a tree, as one follows it out from the trunk, until ultimately we come to the very smallest tubes or bronchioles, corresponding with the little twigs, and through them to the air-cells of the lung, which are like the leaves at the end of the twigs. This means that the air, on its way from the nostrils to the air-cells of the lungs, passes along a very, very tortuous route. The practical effect of this is that, when we inspire air containing dust, all except the very smallest dust particles will fail to reach the lungs, but will be deposited in the nose, the throat, the wind-pipe or the main branches of the bronchi, whence it will be expectorated without causing any serious trouble. It would take too long to tell you of the interesting series of research experiments which established this fact. We must accept it as certain that no dust particle which is greater in size than a diameter of 10 microns, will ever reach the lungs; and probably that we can set the limit at half that. That is to say, the really dangerous dust consists of the particles less than 5 microns in diameter. Particles of this size are, for all practical purposes, invisible; they may be seen as an opalescent haze in a bright beam of light, but they will not be visible as separate particles of dust. This is a most important point about the dusts which produce lung trouble; that it is dust that you cannot see which does the damage.

Now the process of sand-blasting, as you know, is one peculiarly likely to produce fine particles of dust. Silica is easily fractured; therefore when sand particles are blown at high velocity in a jet of air or steam, so that they impinge against a metal surface, there is a tendency for these particles to break up into very small fragments. The alternative to sand-blasting is, of course, to use fine steel grit, known as shot. This process may product dust, but the dust so produced will be much less harmful than that from a sand-blast, because obviously it will contain much less silica. In fact, the only source of silica dust from shot-blasting is from any sand which may happen to have adhered to the metal surface if the article was cast in a sand mould.

Similarly in the case of grinding. Unless the grinding wheel consists of sandstone, or some other rock containing large amounts of free silica, the only source of dangerous dust is from any sand which may have adhered to the surface of the casting. Grinding, though not exactly a "health-resort" occupation, is potentially a much less dangerous job than sand-blasting.

Silica, apparently, has the property of being soluble in body fluid, and, when so dissolved, it has a local destructive effect upon the microscopic cells of the body with which it is in contact. When silica is inhaled in the form of dust particles small enough to reach the actual air-cells of the lungs, it is deposited there, and produces this local effect — a slow destruction of the essential breathing tissue of the lungs. Whenever normal body tissue is destroyed, the body strives to replace it, and if it cannot be reproduced in its original form, the body replaces this destroyed tissue by fibrous or scar tissues, which resembles gristle. Silicosis, the disease produced by the inhalation of silica dust, is essentially a process of slow destruction of the normal breathing tissue of the lungs, and its replacement by nodules or lumps of gristle, quite useless for breathing purposes. As this process goes on, over the years, more and more of the lungs is converted into useless, leather-like tissue, and less and less area is available for normal breathing, until ultimately the unfortunate sufferer literally loses his breath. In an English text-book of

Industrial Medicine, published in the last ten years, there is a very striking phrase, in which the author refers to the dusts which darken men's days and add a breathless burden to their years. That is exactly what silica does; it adds a breathless burden to men's years. It also renders them more susceptible to tuberculosis. All of us who dwell in cities and travel by crowded means of transport with people coughing in our faces, are exposed to the infection of tuberculosis. Most of us contract the disease, and throw it off without even being aware that we have had it. The unlucky ones are those who for some reason have less-than-normal resistance; and therefore the increased susceptibility to tuberculosis, caused by silicosis, can have serious, and literally fatal, results.

The damage that will be done by the inhalation of silica will depend on two factors, the length of exposure to the dust, and the amount of dust in the air breathed. The lungs have a large reserve of tissue for use in emergencies; and therefore can tolerate the inhalation of small quantities of dangerous dust for very long periods. The amount which can be breathed in, day after day, with impunity, is low; if we can keep the concentration of dangerous dust in the air below this limit, it will mean that conditions are safe for those who work there.

The prevention of silicosis depends essentially upon common-sense measures, which in principle are the same for the prevention of any other industrial disease. The first of these is that, as far as possible, instead of using material containing silica, we should use less dangerous substitutes e.g. the substitution of steel shot for sand in blasting. If for any reason this is impossible, then the process should be completely enclosed, so as to prevent the liberation of dangerous dust into the air breathed by people. If this cannot be done, then the process should be enclosed as much as possible and fitted with exhaust ventilation, designed so as to produce an air current away from the breathing zone of anyone in the vicinity. Finally, and very much less reliable than these engineering measures, is some kind of positive pressure helmet, or distant breathing apparatus, preferably the former.

You will notice that I do not mention a filter-mask as an effective personal protection. When it comes to coping with particles of dust of less than 5 microns diameter, only a very good filter can be relied on; and it soon clogs up and becomes difficult to breathe through. Therefore a filter-mask is usually either ineffective or else very uncomfortable and difficult to work in. It depends for its efficiency on regular maintenance of the filter and the valves, and altogether is a delusion and a snare.

Chemical Liquids

Of the other methods of preparation, any acid or alkaline bath may produce various types of irritation or inflammation of the skin. The very strong acids and caustics will produce actual destruction of the area of skin with which they come into contact — the so-called chemical burn, which in appearance resembles an ordinary burn caused by heat, but is usually accompanied by more damage. A hot substance which comes into contact with the skin produces only local destruction over the area immediately affected by the burn, but a strong acid or alkali will soak into the skin and the deeper tissues, and hence will produce damage which continues to spread until the chemical is washed off or neutralized.

Less strong solutions of acids or alkalis will produce an irritation of the skin, accompanied by redness, swelling, heat and pain or itchiness, but without actual destruction of tissue. The skin is moderately resistant to attacks by weak solutions of acids, but rather vulnerable to weak alkaline solutions, including even such apparently innocuous substances as soapy water. These agents act by dissolving the natural grease of the skin; if constantly exposed to this type of attack, the skin, like leather which is not regularly greased, will become harsh and brittle; and instead of bending smoothly with the movements of various parts of the body, it will crack.

The prevention of dermatitis depends on the most elementary common sense. The occurrence of a skin rash is due to the fact that the natural defenses of the skin have been overwhelmed by some irritating substance; in other words that the dose of this irritating substance, or irritant, has been greater than that with which the skin can cope. If we can prevent irritants from coming into contact with the skin, there will be no dermatitis. This may be achieved in various ways; as a general principle, it is better to design the process so as to avoid the necessity for contact with irritants, rather than to rely on individual protection in the form of gloves or other protective clothing. By this I mean that as far as possible vessels containing irritants should be arranged so that splash is avoided; articles should not be dipped with the bare hand, but placed in trays or baskets, or handled with tongs. A little thought given to this kind of thing can often decrease the risk of dermatitis to an almost startling extent.

Gloves are always a worry. For protection against liquids, it is necessary to use rubber or rubberized fabric; and this means that it becomes impossible for the sweat to evaporate from the skin inside the glove — a factor which, in itself, will produce dermatitis in a certain number of people. But sometimes gloves may be the only answer. Their efficiency depends on care and maintenance; a leaky rubber glove is an absolute menace, because anything which gains access to the interior is well massaged into the skin by the movements of the hand.

I shall be returning to this subject of skin trouble, but, before leaving it temporarily, I must emphasize that if ever there was a case in which prevention is better than cure, dermatitis is it. A well established case is a most unsatisfactory thing to treat. Treatment is always a very long job, and it is almost entirely empirical, because what suits one person's skin will not suit another's which may appear absolutely identical. Personally I always try to transfer these cases to a dermatologist at the earliest possible moment, and I heave a sigh of relief when I have done so.

Apart from the fact that the actual treatment is prolonged and unsatisfactory, there is always the risk that the victim's skin may become sensitized to the particular irritant which caused the trouble. Once you have an attack of dermatitis, there is always this chance that your skin may have become sensitized; if it has,

next time you will get severe skin trouble from a dose of the irritant infinitely smaller than the dose which precipitated the first attack. Therefore the occurrence of sensitivity usually means that the victim will never be able to return to work which involves contact with that particular irritant. If you don't get the first attack, you won't become sensitized; hence the importance of prevention.

In my experience there is often great difficulty in persuading management — and particularly management's non-commissioned officer, the foreman — that an employee who has dermatitis as a result of contact with some irritant must be moved away from all further contact with the substance, if he is to recover.

To me it always seems the most elementary common sense that any condition which affects the human body will recover much more quickly if the cause is removed. And yet, one constantly sees cases of industrial dermatitis referred to some quite competent person for treatment, given the appropriate lotion or ointment, and then, before recovery is complete, allowed to return to work which involves further contact with the original cause of the trouble. This kind of thing is, to say the least of it, incredibly optimistic; personally I think that it is just absolutely silly. Under such circumstances you may or may not get complete recovery. If you do, it will take far longer than if there is absolute exclusion from contact with the cause of the trouble. If you do not, you will, in the end, have to move the employee away from the job; and he may never be able to come back to it. Furthermore he may develop a generalized dermatitis, in which, for some reason not properly understood, the resistance of the skin all over the body suddenly fails. Such cases are very distressing for the victim; they are extremely difficult to nurse because the unfortunate patient has no area of skin unaffected; they usually involve several months of inpatient hospital treatment.

While on the subject of acid baths, I should specially mention nitric acid. When metals, and particularly copper and zinc and their alloys, are dipped in nitric acid, a mixture of various oxides of nitrogen will be given off, usually in form of the reddish-brown gas commonly called "nitrous fumes." The action of nitrous fumes on the lungs is very like that of phosgene, which as you know, is a fairly efficient agent for chemical warfare. First of all, during the exposure to the gas, there is a period of trifling irritation of the air passages. This is followed by an interval of some hours in which the victim may feel perfectly well, and then irritation and tightness of the chest comes on, and shortness of breath, which steadily increases owing to the swamping of the lungs with fluid. In a bad case, the affected person becomes unconscious, and is very gravely ill. The snare about poisoning by nitrous fumes is this intermediate period of some hours, in which the patient feels perfectly well. Unless people are aware of the danger, it is quite easy for a person exposed to nitrous fumes to breathe in a fairly large dose, experience some temporary, fairly acute discomfort, and then, perhaps after rather elementary first aid, apparently recover completely. He may go home, unattended; he may even go back to his normal work; and some hours later, he will collapse, acutely ill. As those of us who have been associated with the explosives industry know full well, no case of exposure to nitrous fumes should ever be treated lightly.

Organic Solvents

The third type of preliminary preparations which I mentioned was the cleaning of articles by organic solvents. From the industrial medical point of view, this opens up a multitude of possibilities. First of all, there is the risk of dermatitis; secondly there is the fact that practically all organic solvents have some action on the central nervous system; and thirdly, many of them have poisonous effects in other parts of the body.

The action of a solvent in causing dermatitis is simply that it dissolves the natural grease out of the skin, leaving it harsh and brittle and easily cracked. Obviously the more effective a solvent is for use as a degreaser, the more likely it is to produce dermatitis in this way. It is possible but not certain that some solvents may be directly irritating, as well as producing dermatitis by this de-fatting action. Prevention, of course, depends upon elementary common sense. If we prevent the solvents from coming into contact with the skin, they cannot cause dermatitis. Dipping baths and degreasing vats should be designed to avoid the risk of splashing; articles to be dipped should be handled with pliers or tongs, not with the bare hand. If the risk of splashing is absolutely unavoidable the employee should be provided with adequate protective clothing which must overlap from above downwards. But this is a most unsatisfactory substitute for forethought in designing the plant to avoid splashing, if only because it is difficult to get the material that affords adequate protection against some of these solvents. The only possible ones are likely to be oilskin fabric, rubberized cloth, and rubber (natural or synthetic); these may become porous if used in the presence of certain solvents, and hence have a very limited period of usefulness. At hot processes, and in any part of the factory during hot weather, the fact that sweat cannot evaporate satisfactorily inside these fabrics both adds to the possibility of skin trouble, and interferes with the mechanism by which the body normally controls its temperature.

Solvents which are used for degreasing fall into a number of chemical groups. There are aromatic hydrocarbons, such as benzol, toluol, xylol and various naphthas; there are the paraffins, such as petrol, kerosene and some of the liquids commonly called white spirits; there are turpentines, natural and artificial; there are chlorohydrocarbons, such as tetrachloroethane, carbon tetrachloride, and trichlorethylene; there are alcohols; and there are various others. They are nearly all volatile liquids; that is to say, they evaporate easily. Therefore it is easy for them to enter the body through the lungs, by being breathed in, in the form of gas or vapor. When this vapor reaches the air cells of the lungs, it is absorbed into the blood, which carries it to all parts of the body, so that theoretically structures anywhere in the body may be affected by it. But it happens that the cells of the brain contain more than most other parts of the body of a fatty substance called lipase; and all these solvents have a particular affinity for lipase. Therefore they have a selective action upon the brain. This, of course, is the

principle upon which we rely in inducing anaesthesis by inhalation. The anaesthetic is breathed in, in the form of vapor; it is absorbed into the blood and so carried all over the body; but it exhibits this selective action on the brain, producing unconsciousness before it interferes seriously with other vital functions. Ether, chloroform, carbon tetrachloride, and trichlorethylene are all good degreasing fluids; and each has had a long and successful record as a fairly safe anaesthetic. Each of the four substances that I have named has claimed its victims; none is completely fool-proof, but unfortunately most industrial solvents are far less safe than these.

We can take it that whenever solvent vapors are absorbed in sufficient quantity, they will produce either inebriation or narcosis; in other words, they will produce unconsciousness, either directly or after a preliminary period of excitement and mental unrest. If they are inhaled in quantities insufficient to produce unconsciousness, there will be some disturbance of normal mental processes, which may show itself as dopiness or slowness of thought, or, as in the case of alcohol, in disorderly thinking. Therefore the effect of continued inhalation of small quantities of solvent vapor may be a diminution in efficiency of work done, owing to this partial dopiness.

That is not the whole story. Certain of these substances produce damage in other parts of the body: unfortunately some of the best of the industrial solvents are among the most poisonous. For example, in the 1914-18 war, tetrachlorethane, which produces toxic jaundice, killed several hundred people in aircraft factories in Great Britain. Finally its use was prohibited there. In the recent war one of our allies used it in one particular process in Australia, and killed at least two of their own service personnel and one civilian. Benzol, which is one of the cheapest and most efficient of the industrial solvents, is also one of the most toxic, producing a type of anaemia which, once it is well established, had hitherto always been fatal. Even trichlorethylene, which some years ago had considerable vogue as an anaesthetic, has claimed its victims.

The moral of all this is that cleaning and degreasing vats should always be carefully designed, so as to avoid risk of liberating vapor into air which will be breathed. Similarly, articles which have been cleaned should be placed in special draining or drying racks, equipped with adequate local ventilation, instead of being allowed to evaporate solvent vapor into the air. The man who cleans metal parts by dipping them into an open bucket of trichlorethylene, probably bending over and taking a good sniff as he does so, is certain to finish the day's work in a rather dopey condition, and, if he makes a habit of this kind of thing, may ultimately be as pitiful a wreck as the man who habitually takes an overdose of that much less poisonous narcotic, alcohol.

The other moral is that, whenever there is a choice of solvents, the least toxic one should be used for the job. There is a wealth of information available about the toxicity of industrial solvents; in fact a most excellent monograph on that subject by *Dr. Ethel Browning* has been published by the Industrial Health Research Board of Great Britain. Often any one of several solvents will be equally good for the job, but some may be much less toxic than others. It is folly to use one of the more dangerous when a safer one will do the job equally well. Remember that, in cases of poisoning by tetrachloroethane, benzol, probably toluol, carbon bisulphide, and a few others, by the time any symptoms of illness appear, the damage has been done, and it can never be undone. In using these substances we are playing about with the physical or mental health of human beings: and it behooves us to beware of what we do.

Plating Processes

When we come to the actual plating process proper, the most dramatic example of an industrial health risk is, of course, chrome ulceration. The chrome ulcer, or chrome hole, is perhaps the best known of a series of skin lesions known as the trade ulcers. These result from the local action of certain destructive chemical agents which have gained an entry into the deeper layers of the skin or mucous membranes. The initial lesion is a breach in the continuity of the skin or mucous membrane, usually produced by some quite trivial and perhaps forgotten injury. Through this breach, the specific chemical agent gains an entry into the deeper layers of the skin, and penetrates deeply and in all directions, burrowing under the superficial layers of the skin, and producing either a punched-out ulcer, or else a flask-shaped excavation with a relatively narrow opening. These trade ulcers are usually very slow to heal. Some of the most common causes are indicated by the names "chrome holes," "nickel holes," and "cyanide holes." I shall deal in some detail with chrome ulceration, as typical of the whole series.

Firstly we must distinguish between chrome ulceration and chrome dermatitis. The latter is a generalized, probably acute, reaction of part or the whole of the skin to chromic acid, which usually reaches the skin in the form of fume or mist. On the other hand, a chrome ulcer usually commences at the site of some trivial injury or crack in the skin. The ulcer is not very painful, and spreads in the deeper rather than in the superficial layers of the skin: that is to say, it usually has an undermined edge. The holes are conical or cup-shaped in general contour. Once formed, they usually take weeks to heal.

People who breathe in a mist of chromates or chromic acid fumes may contract a similar ulcer in the mucous membrane of the nose, usually on the nasal septum. Such an ulcer commonly penetrates right through the septum and this deficiency may never heal completely.

The prevention of chrome ulceration depends on intelligent co-operation between employee and management. The employee's part is the smaller, but he must learn the importance of personal cleanliness, and of scrupulous care of the skin, of the hands particularly, at work, and also at home, because injuries caused at home may be followed by chrome ulceration at work. Any injury, however trivial, should always be treated immediately by a thoroughly competent person. Management should aim at the elimination of sharp angles, and awkward working places, and hence at a decrease in the risk of skin injury. Vats containing solution, and similar apparatus, must be designed so as to avoid, as far as possible, all risk of splashing.

Good washing facilities with warm water, in or close to the shop, are very important. All injuries, however trivial, should be dressed with waterproof adhesive plaster if the employee is going to continue at work which may bring him into contact with chrome solution. Ordinary adhesive plaster is useless and even dangerous. The intelligent use of protective clothing, of course, is essential.

As I have said, nasal ulceration is caused by breathing in fumes or mist containing the irritant solution. The standard method of protection is well known to you all, depending on the use of exhaust ventilation drawn through slots extending the full length of each side of the tank. Recently I came across a reference to another method of control which may be known to some of you, but which is new to me. It consists of the use of a floating baffle of plastic chips, to prevent the loss of chromic acid mist from the tank. Plastics used for this purpose must conform to three essential requirements: they must be chemically inert to the plating solution, they must withstand the conditions existing in plating tanks; and their density must be such that they will float on the surface of the plating solution. I have no personal experience of this method. I understand that some exhaust ventilation is still essential, but the use of plastic chips both diminishes the risk of atmospheric contamination and decreases the loss of chromic acid through the exhaust system.

Chrome ulceration is the best known of these trade ulcers, but nickel salts, and some cyanides, as well as some other substances not so likely to be encountered in plating works, can cause a similar type of trouble. Ordinary dermatitis is more frequent than ulceration in those exposed to solutions of nickel salts; it is sometimes known as "nickel itch."

Apart from the risk of skin trouble, to my mind, the principal hazard in plating plants arises from the extremely toxic nature of some of the salts, particularly, of course, the cyanides, which are deadly poisons if swallowed. The most serious risk with the cyanides is the possibility that acid may be introduced and thus cause the evolution of large volumes of hydrogen cyanide or prussic acid. Cyanide should never be stored near acid, and acid baths should not be close to cyanide baths. I understand that during the early days of the bombing of London some fatalities in plating plants were reported as a result of the mixing of acids and cyanides. This is perhaps understandable under these circumstances, but in normal conditions it is inexcusable to run a risk of this particular accident. Of course, in any case, there will be a slow evolution of prussic acid from any cyanide bath, as a result of interaction of the salt with the carbon dioxide of the air, and this evolution will be more rapid if the bath is heated. Except in the latter case, good room ventilation will usually suffice to keep the concentration of hydrogen cyanide below the maximum safe limit. But if the bath is heated, or if it is operated so as to evolve gas which may carry a spray or mist into the air, then special ventilation of a type similar to that used on chrome-plating baths may be necessary.

Cadmium is rather an anigma. Fumes which are given off when the metal is melted can produce acute poisoning, which may not always be recognized because it has a delayed action. This seems to be a risk likely to affect those engaged in casting of cadmium electrodes. As a matter of interest, cases have been reported of deaths that have occurred from welding cadmium plated parts, and from drinking acid fruit juices, and similar fluids which have been kept in cadmium plated containers. So that it would appear that cadmium should be treated with great respect. On the other hand, I gather than cadmium poisoning is not usually associated with the actual plating operation.

Finishing Operations

As I understand it, after the plating process comes some polishing operation. Once again, the risk is largely associated with the inhalation of dust. Many of the substances used as polishing powders contain a very high proportion of silica. If the dust of these powders is inhaled in big enough doses for a long enough time it will produce silicosis.

It is worth while inquiring whether some other polishing powder, not containing free silica, will do just as good a polishing job. This is a matter of which I cannot speak with exact knowledge, but I have had experience in a somewhat similar field. During the recent war I was associated with an inquiry into dust concentrations in foundries, and, at a later stage, into the same problem in a factory manufacturing foundry facing powders. I discovered that in many cases the choice of a facing powder was entirely arbitrary. Some powders contained a high proportion of free silica; others, which I was told were equally useful for the same job, contained no free silica at all. The choice between these appeared to depend very largely upon tradition in individual foundries. It may be possible that the same thing occurs in the choice of a polishing powder in your industry.

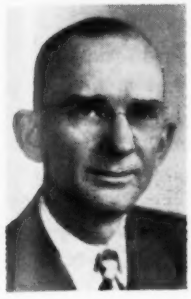
Apart from the risk of silicosis, I think that there is little that need trouble us in polishing processes. A good deal of the dust will consist of fine particles of the metal being polished; and most evidence points to the fact that there is little risk in the inhalation of metallic dust — even of those metals, such as lead and cadmium, whose compounds are so dangerous.

Conclusion

Modern industry necessitates the exposure of people to many substances which never previously formed part of the human environment. In such circumstances, it is inevitable that medical knowledge should lag some distance behind industrial progress. But it has not lagged quite as far as some people think. There is wealth of knowledge available about most of the health risks in industry, if you know where to look for it. What is required is the awareness of need to look. In these days of chronic shortage of labor, and still more of inefficient labor, we do not want to have in our works avoidable causes of ill health and absenteeism. We do not want them at any time, but particularly we do not want them today. I suggest that, just as it is the business of somebody in the firm to keep abreast of technical knowledge, so also it should be somebody's business to keep himself informed of the risks associated with various processes, and of the measures which should be taken to avoid them. You will find that most of these measures are simply applied common sense.

White Brass Plating — A Progress Report

By W. B. Knight, *Knight Plating Co., Detroit, Mich.*



IN view of present day conditions, wherein we are constantly facing changing circumstances of supply and demand, aggravated further by government restrictions as to usage, it is absolutely essential that substitute finishes for metals be made available wherever possible. The quality, availability and cost of such substitutes are of prime importance. Primarily, my experience has been governed by the requirements and specifications of the automobile industry, and I can assure you that I am not aware of any limit to their desires as to quality, service or lowered costs!

The first metal to practically disappear from our civilian economy was cadmium. Platers and users were not hit too hard by this, as zinc and phosphate coatings have so far been sufficient for replacement in most instances. Nickel and copper (when we mention the metals we also include their salts) are the greatest worry to all platers. When we speak of worry the term is used literally, as the plating industry is facing its greatest trial insofar as civilian use is concerned; it is even a question of survival in many cases.

Chrome plating is the major item in most plants and represents the greatest dollar volume of sales, and here lies the all-out effort for a satisfactory substitute, especially for the nickel undercoating.

Analyzing all the available data, including the efforts of the *National Association of Metal Finishers* and the March-April 1952 plater's quota of 25% of base usage (if you can get it), it looks like very poor prospects for nickel for civilian plating for probably the coming two years at least.

Many avenues have been checked and explored, such as bright zinc plate with various treatments, including lacquered or waxed finishes. Chrome over copper, with lacquer, enamel or wax, is not the complete answer desired, although it is used.

In the case of *Knight Plating Co.*, in the Fall of 1950 we carefully checked over all the data available to us and adopted white brass as the most promising or feasible substitute for nickel. White brass was known probably twenty years ago through the work of *Wernlund* and *Oplinger* of *Du Pont's Electrochemical Dept.* However, the commercial demand then was practically non-existant, and no particular use made thereof. Our testing was started and our first production unit was in operation in February or March of 1951. We have made considerable progress in the development of this plate over a period of months and anticipate greater improvement in the future.

Essentially it involves a cyanide type of plating solution with certain brighteners and addition agents, plus anodes of zinc and copper. 80% zinc and 20% copper can be taken as basic, and variations therefrom will be as individually determined to obtain desired results. It takes chromium plate very readily, with wide coverage or as it may be termed good "throwing power." The optimum thickness at present is approximately .0002" minimum, .0003" maximum, for best results. In our experience, however, some parts may require a thinner plate. We plate direct to base metal, thus eliminating nickel entirely, as well as the copper undercoat usually used under nickel plate. In certain circumstances, however, the copper coating may be required. It is conceivable that white brass could be used in any sequence or combination of plates, such as over or under copper, etc.; the value of these has not yet been explored fully nor evaluated. As of the present time very close laboratory and operational control with white brass baths is an absolute must. White brass withstands salt spray very well insofar as red rust on steel is concerned, but more development must be done regarding white corrosion products. Wiping off this white film leaves a good appearing surface as long as the chromium plate endures. Opinion exists that the salt spray is not the medium of evaluation that should be used and does not altogether determine the qualities of this plate; however, it is the measuring stick we have to abide by. There are a number of problems yet to be solved, but there is great confidence that these are not insurmountable and that there is a good future for white brass-chromium plate.

Stripping white brass is not very difficult compared to the difficulty of stripping nickel; no harm occurs to the base metal.

At our plant we converted our nickel plating machines to white brass. These were originally built and/or modified by us to produce heavy nickel plate. In these the plating time is about fifteen minutes. We are also producing white brass in standard submerged plastic-type barrels. Here the load is up to 200 lbs. with plating time about thirty minutes. All tanks are lined. Temperature is what we term as warm, approximately 100°F. As for the current used, this is anybody's guess, as many years ago we eliminated tank rheostats and meters as a useless expense and hindrance, being of no value in our type of work in these solutions. We have approximately 4,000 gallons of white brass solution in operation at the present time, and during the period of June-November, 1951 we barrel plated over 80 million screws with white brass under chrome.

In addition, still tank or rack plating is being developed. Due to our successful operation in barrel or bulk plating, the entire industry became interested and a great deal of work is now in process. In our case, and especially at the request of one of the large automobile

companies, we started to conduct development of the still tank method in November 1951. We would like to point out that we are not able as yet to draw any final conclusions from our work, and the opinions voiced herein may be changed in the light of some future developments. However, we are daily progressing in what we believe will be a successful project.

Before we summarize the work done thus far, we wish to first re-establish the purpose of this program, and second, to indicate some of the results we have or hope to obtain.

The purpose of this program is to develop a practical method for the deposition of white brass from a still tank solution, the practicability to be judged by its success or failure to meet the following criteria:

1. The plate must be uniformly bright.
2. It must provide a good base upon which to plate chromium.
3. A combination of white brass and chrome plate must stand baking without cracking.
4. The final plated article must give adequate protection against corrosion.

With these goals in view, we started work on the program the first of November. In order to save as much time as possible it was decided to install a 250 gallon tank in the plating shop immediately. In this way we hoped to be able to use the results obtained in the 8 gallon laboratory solution on a small production basis without any delay. This method has proved to be very practical, and parallel results have been obtained at each step of the way.

Our previous work with barrel white brass solutions helped immeasurably in indicating the type of solution which would most likely be successful in a still plating tank. The original solution we used showed certain characteristics typical of still tank white brass solutions used throughout the industry at this time. The plate has a tendency to be extremely brittle, anode corrosion was poor, and the bright plating range of the solution was very narrow. An effort was made to correct these difficulties by adjusting the chemistry of the bath, with little improvement in the results. Solution agitation was tried, with varying degrees of success; as might be suspected, agitation did extend the bright range somewhat. However, it did little to eliminate the brittleness. In fact, if the agitation is too severe it apparently increases the tendency towards brittleness. It was at this point that we turned our efforts toward finding a secondary brightener. We hoped to find a compound that would increase the bright range, promote anode corrosion and result in some grain refinement of the alloy plate. This last, it was hoped, would result in a less brittle plate. Several different compounds were tried, and one in particular has shown very promising results. It not only seems to fill the qualifications we were looking for, but in addition it seems to stabilize the white brass plate; that is — it retards the tarnishing usually associated with white brass.

Finally, we would like to discuss the importance of the chromium plate deposited over the white brass. In our work over the past year with barrel white brass and chrome, it has always been apparent that the quality of the chrome plate determined to a large extent the value of the total plate. All our earlier discussion has indicated the tremendous value of a crack-free chrome plate, if such was available. By crack-free we refer to one free of the net work of fine cracks always associated with chromium plate. There is a real possibility that we may be able to produce such a crack-free chrome plate. If this is accomplished the salt spray resistance of white brass and chrome will be greatly increased. It is our intention to include this in our white brass project and to start work on a crack-free chrome as soon as possible. This cracking does not appear in our bulk plating process.

In about the first week in December four pieces of automobile grilles were tested by a large automobile company, whose report to us stated: "Three pieces were subjected to a 50 hour salt spray test. At 24 hours exposure there were no white corrosion products. At 36 hours white corrosion products appeared which washed off readily. The pieces were removed from the salt spray at 50 hours exposure. At this point there were numerous white corrosion spots which did not wash off readily. The surface was bright otherwise on all three pieces. The adhesion was good. Plating thickness is white brass .0003" — chromium .00001"."

Washing off with water and light cleaner removed white corrosion.

We again submitted 12 pieces of steel grille for test and the report of January 28, 1952 shows: "All of these parts developed light white corrosion products between 40 and 50 hours salt spray exposure. The white corrosion products, although not very heavy, did not wash off readily."

White brass plate is ductile; we have bent and torn base metal (steel) in pieces, crushed, twisted, etc., without failure of plate.

The bright plating range has been extended to give a 100% bright panel. However, a working range of near zero to 100 asf is entirely sufficient for plating purposes.

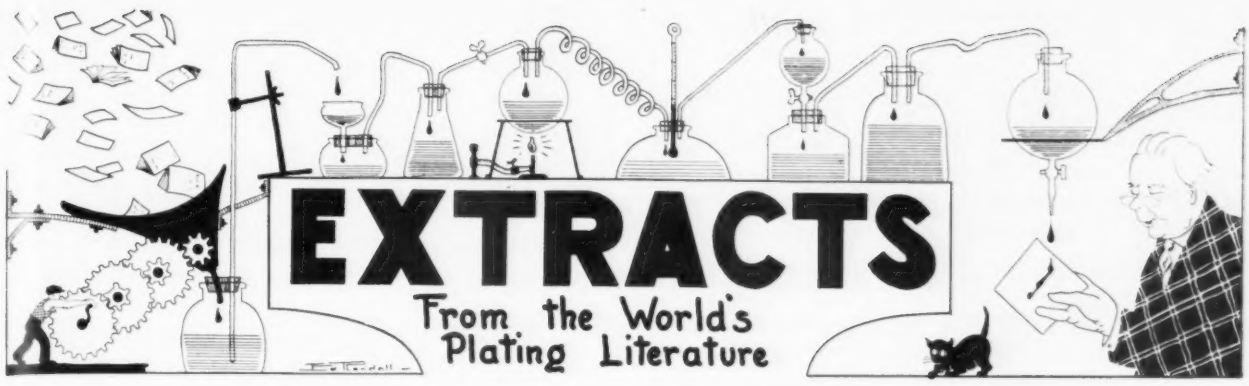
The metal as deposited is fairly uniform in composition. For instance, 80% zinc 20% copper is held within a fraction of a % either way. After the 50 hour salt spray test a piece was checked and reported to contain 18.77% copper, which was the lowest value as yet reported to us.

The thickness of the chromium plate is very difficult to determine by the drop test; the color of the underplate too closely resembles the color of chromium. No cracking of the plate occurs prior to baking, and of this date (February 12, 1952) we have not as yet had the opportunity of checking on baking at various degrees of heat, though we are confident none would occur under approximately 200°F.

A number of pieces are now on automobiles in actual service and we hope therefrom to obtain more information in the near future. There is quite a widespread opinion that white brass is satisfactory for interior or mild exposure; the whole effort is to improve outside or severe exposure results.

For general solution formulae and procedures reference is made to regular supply concerns which are now promoting this type of plate.

As mentioned above, we have found it necessary to modify standard formulations to get the exact type of bath we need in our system of operations.



Plated Coatings on Cast Iron

Werkstoffe und Korrosion, vol. 3, No. 1, pp. 37-38.

For heavy high-duty performance, electroplated chromium is being used more and more for improving the surface properties of cast iron to wear resistance. Porous chrome plating is used for coating cylinder bores for petrol and diesel engines. With the mechanical method, the hard chromium plate is applied to a previously roughened cast iron surface: with the "pit and channel" method the porosity is induced by chemical and electrochemical etching of the Cr plate.

Cadmium coatings have many of the advantages which are possessed by zinc coatings, in the way of providing electrochemical protection of the cast iron against corrosion. Plated zinc coatings are a particularly favorable proposition for application to cast iron surfaces and can be applied both from acid and from fluorborate baths easily to the cast iron. Copper coatings also find considerable application as an undercoat for nickel plating on cast iron and for chromium plating as well as an intermediate coat for other metals.

Properties of Hard Chromium Plating

P. Morisset: *Metaux et Corrosion;* vol. 24, No. 291, pp. 246-260.

Details are given of the behavior of hard chromium plate in contact with 166 various compounds. The structure and thickness of the plated coating, electroplating conditions and surface pretreatment and subsequent handling are discussed. It was rather surprising to find the good protective properties given by the hard chromium plate to the base metal in contact with nitric acid, sulfuric acid, chlorinated petroleum hydrocarbon, chlor-acetic acid, fatty acids as well as many other organic acids and phenols.

Nickel Allergy — Occupational Disease with Nickel Salts

G. Koerfgen: *Metalloberflaeche;* vol. 5, No. 7, pp. B100-B101.

The skin is naturally provided with a protective mantel of grease and also an acid mantel. The protective grease mantel is damaged particularly by active degreasing compounds used in plating processes such as caustic soda, Vienna chalk, triphosphate, sodium carbonate etc. These degreasing agents also, having a strong alkaline action, have a disturbing effect on the natural acid mantel of the skin. This continuous degreasing and alkaline action and the effect on the skin by becoming alternately moist and dry, causes it to become rough and cracked. This is wear dermatitis or degenerative eczema.

When this condition is reached, there is presented the further possibility of occupational skin infection. By contact of the skin with a great many compounds, in the course of time a condition of hyper-sensitivity is set up, i.e. the skin responds to renewed contact by forming an eczema. Such eczemas are termed allergic eczemas. Whether the skin assumes this hyper-sensitive condition and how long it lasts depends among other things on individual skin and the bodily state of health. In nickel plating operations, nickel salts such as for example, nickel sulfate, by continued contact can lead to a hyper-sensitive eczema of this type. This is termed nickel dermatitis. It occurs first at the point of greatest exposure and breaks out on the hands and then in some cases can spread all over the body. Besides the hyper-sensitive condition set up as above, there is also the inborn hyper-sensitive condition, in which the individual is more or less immediately allergic to nickel salts, without the skin being brought to the condition of hyper-sensitivity by a more or less prolonged period of contact. In practice, these two forms of degenerative and allergic eczema are difficult to separate from one another as they can overlap. Hand cleaning with unsuitable materials such as petrol and paint thinners can also damage the skin and lay it wide open to subsequent attack by plating solutions. Gloves and special hand cleaning soaps are suitable precautions in this case.

Steps to counter the onset of nickel dermatitis in a nickel plating works are first to separate the personnel who have inborn allergy and will quickly develop this trouble in contact with nickel salts. While sensitivity to alkaline and degreasing substances can only be ascertained by complicated methods, the rag test provides a simple and rapid test for hyper-sensitivity to nickel salts. This test is conducted by soaking a piece of linen rag, 1-2 sq. cm. in size, with a 10 pc. aqueous solution of nickel sulfate, covering this with a larger piece of water proof material, and securing the whole tightly with sticking plaster. A second control test is made in exactly the same manner, with the rag soaked in water in this case. After 24 hours, both the skin tests are removed. If the place on which the rag soaked in nickel salt is clearly reddened and may even show slight blis-

tering, then a hyper-sensitive condition must be assumed.

Influence of Wave Form of Rectified Direct Current on Growth and Properties of Plated Metals

Max E. Beckmann and F. Maass-Graefe: *Metalloberflaeche*, vol. 5, No. 11, pp. A161-A169.

A study was made of the effect of the wave form of the d.c. current flow from a.c. rectifier equipment on the plating conditions and properties of the plated metal. The influence of the current in the case of a perfectly constant direct current and by imposing also on the d.c. a symmetrical alternating current of 50 periods/sec. has already been investigated in detail. The present work covers research on d.c. current supply as delivered from rectifying equipment, as regards its effect on the plating results.

In previous research, *Steiner* had found that the wave-form of a rectified a.c. current for d.c. plating had a definite influence on the properties of the plated metal in all the baths examined. The influence on the plated metal crystallization in most cases was found to be a favorable effect. No fundamental examination of the plate was however made. With increasing wave-form, it was found the throwing power of the bath was adversely affected as well as the cathode efficiency. The present research covered investigations on the crystal growth of the plated metal. The following baths were examined: alkaline and acid zinc baths; alkaline and acid copper baths; acid nickel baths; chromium bath. The dry rectifying plant, fed at 330 volts-50 periods/sec. was arranged to give a maximum d.c. flow of 20 amps, 20 volts. The bath voltages and current densities were obtained by single and dual phase operation by resistance regulation on the primary side of the rectifying transformer and with 3 and 6 phase operation by the choice of corresponding transformer tappings, and with battery operation with pure resistance regulation. The different phase operation gave different wave-shape form to the rectified bath current, from high peaks with single phase operation, progressively to a smoothed, slightly rippled wave form with 6 phase operation. Glass tanks, except for chromium were used of 3 litres capacity. The following results were obtained.

Structure of the plated metal from the bright zinc bath was practically the same with the three current types—1 and 6 phase and d.c. battery. From the matt zinc bath, the plated metal with the battery and 6-phase current had a very similar structure to the bright zinc deposit. With the 1-phase current, the plated metal differed in structure from the other two. No difference in structure was seen with the metal from the matt acid zinc bath with the three types of current. Thus only a slightly perceptible effect was found with the alkaline zinc cyanide baths with 1-phase current. Tests on the alkaline and acid copper baths showed similar results. Also, with the acid copper sulfate bath, no structural difference was found. Again, with the acid nickel bath, microscopic examination showed no differences in the structure with the three types of current.

The only bath in which the effect of the wave form of the plating current was noticeable was with hard chromium plate. With 1-phase current rectification, the chromium coatings were matt-gray as compared with the plated metal obtained with the other current types, which had the normal bright appearance. Reinken (*Metal Finishing*, vol. 45, Feb.) had previously stated that uni-phase rectifiers give good plating results except with hard chromium baths and the above work confirms this. Apparently in the metal plated with 1-phase rectified current, hezagonal chromium is present. This was confirmed by microscopic examination.

Elimination of Organic Impurities in Nickel Plating Baths

Galvano (Paris); vol. 20, No. 176, pp. 11-14.

Many organic substances present as bath impurities must be eliminated by methods comprising (1) Electrodeposition on auxiliary cathodes; (2) Absorption; (3) Oxidation. The first method can only be applied to slightly contaminated baths. The last two methods are more rapid and more generally used. Absorption is a simple method of removal if it can be used. Materials for removing such organic impurities by absorption can be divided into two groups (a) by addition to the bath solution of a finely ground substance which is chemically inert; (b) By the addition of one or several substances which by reaction between them and with the solution, give a precipitate. Because of the extent of the surfaces in contact per unit of volume and the activity of these surfaces, at the moment of their formation in the solution, the precipitates have a strong power of absorption. Typical precipitants are: (1) Hydrated ferric oxide, formed by the addition to the solution of a ferrous salt and the solution then subsequently treated by hydrogen peroxide to oxidize the iron and to precipitate it as ferric oxide (provided that the pH of the solution is higher than 4 to 4.5); (2) Hydrated manganese dioxide obtained by the reaction of a manganese salt on potassium permanganate. The effectiveness of these treatments was tested in the following manner.

A concentrated solution containing: Nickel sulfate 240 grms/l; boric acid 30 grms/litre; potassium chloride 20 grms/litre with a pH of 5.6 to 5.8 was contaminated by the addition of gelatine or dextrine. The appearance of the nickel deposits obtained of a thickness of 0.04 mm. (about 0.002 in.) was examined before and after different treatments. Complete effect was obtained with the manganese dioxide treatment (1 grm/litre of $MnSO_4 \cdot 4H_2O$ plus 0.4 grms/litre $KMnO_4$), for gelatine and dextrine concentrations of 0.012 grms/litre; partial effect was obtained with concentrations of these substances of 0.065 and 0.1 grms./litre respectively.

The organic matter present as impurity can be oxidized by various agents. The potassium permanganate treatment is recommended as the one which has been found most satisfactory in use and the treatment is conducted at ordinary temperature. It is first necesganate necessary by a test on a sample taken from the sary to determine the approximate quantity of permanbath. For baths only slightly contaminated by organic impurities, an addition of 0.25 grms. of potassium permanganate per litre is generally sufficient. For more contaminated baths, a greater amount is necessary

rising up to 1 grm./litre. With wooden lined plating tanks, it is necessary to pass the solution into a lead lined tank before treatment. All the anodes, filter bags, etc. should be withdrawn from the tank and the pH is necessary, brought to 3 by the addition of sulfuric acid. The permanganate is then added in aqueous solution with agitation. After standing for 2 days at 35°C. the excess of permanganate is eliminated by addition of hydrogen peroxide. Excess hydrogen peroxide must be avoided. The solution is then filtered back to the normal plating tank and the pH adjusted to correct working value, by adding nickel carbonate or hydrate. Large scale practice over several years with the potassium permanganate treatment has given good results.

Influence of Screening Masks on Cathodic Metal Distribution in Plating Baths

J. Steiner and K. Schery: *Metalloberflaeche*, vol. 5, No. 9, pp. B129-B132.

The distribution of the current lines of force in the plating bath have a definite influence on the quality of the plated metal deposit, both the surface properties as well as the compactness of deposited metal being influenced. Control of the bath current distribution by control of the bath composition can only be conducted within relatively narrow limits. Conductive or non-conductive masking screens influence the metal distribution very greatly and in a favorable manner. Plating screens are not in extensive use at the present time, because sufficient data is not available in the way of exact measurements, regarding their effects on the metal depositing distribution. Screening masks in an incorrect plating set-up can give a most favorable effect. Slatted screens have been previously investigated but no work has been done on the much more technically important circular screens.

In this research the current distribution at the cathode was measured electrically and the metal deposition distribution was determined from this. The plating bath had a length of 25 cm., a width of 15 cm. and a height of 18 cm. The electrolyte depth was 15 cm. The two electrodes were flat and circular in shape, each being 1 sq. dm. in area and were placed axially apart at 15 cm. distance. The cathode was divided into 5 equal flat, annular rings, insulated from each other, for current distribution measurement. Each ring segment was provided with separate current supply. The current flowing to each ring was measured by a simple electrical compensating method. The metal distribution factor at the cathode was given by the ratio of the metal deposited on the ring cathode with the greatest current density to that separated on the ring with the lowest current density. With the above given spacing arrangements in the test bath, this metal distribution factor amounts from 1.4 to 3.4. Low metal distribution factors correspond to baths with good throwing power and higher ratios to baths with bad throwing power. With all tests the current density was 1 amp./sq. dm. (10 amps./sq. ft. approx.). The non-conducting screening masks were 0.5 mm. thick.

The effect of spacing between the screening mask and cathode was tested with a copper sulfate bath. It was found the effect of the screening is the greater, the nearer it is progressed towards the cathode. The metal distribution becomes at first more favorable with closer approach of the mask to the cathode: with further approach beyond a critical point, it becomes again unfavorable. The screens were used in the form of circular openings in a square-shaped flat sheet. The smaller the screening mask opening, the greater the screening influence. With a diameter of the opening in the screening mask exactly the same as that of the cathode (11.3 cm.) a considerable improvement in the metal distribution is obtained ($k = 1.79$). A mask opening of 5 cm. gives a very good metal distribution ($k = 1.44$). It was found that the full effect of the mask is only obtained if this fits tightly the cross-section of the bath and current and bath electrolyte flow can only occur through the central screen opening. An almost ideal current distribution in the test bath was obtained with a mask of 10 cm. diameter opening and 0.5 cm. thickness at a distance of 1 cm. from the cathode — k 1.04.

Electroplating Thallium from Fluoborate Baths

E. Bertorelle, L. Giuffre and A. Tunesi: *Galvano* (Paris), vol. 20, No. 177, pp. 18-20.

The authors studied the electroplating of thallium and thallium lead alloys from fluorboric acid baths in the presence of certain organic addition agents. Previous experience had shown that the fluorboric acid baths are preferable to the baths based on perchlorate or fluorsilicate from the viewpoint of compactness of the deposits. It is possible to obtain satisfactory coatings of 2 mm. (0.08 in.) upwards, by maintaining constant the following conditions at ordinary temperatures with cast thallium anodes and well degreased aluminum cathodes:

1. Content of the bath in thallium fluorborate, free fluorboric acid, aloine, peptone and cresol.
2. Current density.
3. Mechanical agitation of the bath solution.

The solution is filtered when it becomes too clouded. The following table gives the results obtained from baths of various compositions. It will be seen that the electrolyte No. 3 gives the best results. It is essential that the concentration of thallium fluorborate, fluorboric acid remain respectively at 150 and 16.9 grms./litre while the current density can vary from 0.1 to 0.5 amps./sq. dm. (lower values in preference) — (approximately 1-5 amps./sq. ft.). The aloine, peptone and cresol are indispensable to avoid anodic polarization and to obtain compactness of the plated deposits. Small additions of $Al(OH)_3$ of 1 to 5 grms. litre are useful. Ebonite baths are used with gentle and continuous bath agitation. With electrolyte 3, the anodic solution was very regular.

Composition of Thallium Plating Baths

Bath No.	*1*	*2*	*3*	*4*	*5*	*6*
$TlBF_4$	150	150	150	150	140	160
HBF_4	10	15	16.9	20	16.9	16.9
Aloine	5	5	5	5	5	5
Peptone	10	10	10	10	10	10
Cresol	10	10	10	10	10	10
Nature of Deposit	Compact then spongy	Compact then dendritic	Compact	Little Compactness of deposit		

Big Exposition and Convention Foreseen

CHICAGO JUNE 16-20

ALMOST all of the exhibit space at the International Amphitheatre has been sold out for the Industrial Finishing Exposition of 1952. The American Electroplaters' Society sponsored show on June 16 to 20 promises to be the biggest in the 39-year history of the A.E.S.

The I.F.E. show will not be limited to just the eelctroplating field, according to the Exposition Committee. Members of the paint, varnish, lacquer enamel, materials handling, industrial tapes, abrasives, metal treating and other allied fields have taken space to display their products and services.

Special Plating Exhibits

Several noted exhibits outside the regular trade exhibits will be on display for those attending the convention..

The Chicago Electro-Platers Institute will have a working model of a barrel plating line which will be coating nuts and bolts with zinc, with a special finish, subsequent olive drab, (military type) and bleached chromate (decorative type) finishes.

A still plating line will plate parts coated with white brass alloy plate and chrome plate.

The items, says the C.E.P.I. Exhibit Committee, plated on this line will be given to exhibitors as a useful and educational souvenir of the Industrial Finishing Exposition.

The Institute plans to exhibit panels showing the various finishes that the member firms can plate. The panel will show all stages of finishing from raw materials to the finished product, with various types of base metals and all types of plated coatings.

Military specification finishes will also be shown. The member firms will furnish their own personnel to man the exhibits and will have technical men and salesmen to explain the many methods and procedures.

A.E.S. Research Exhibit

Another feature will be the American Electroplaters' Society Research Exhibit. Although full details have not been revealed, the Exhibit Committee has passed along some information concerning their presentation.

Dr. Harold J. Weisner, chairman of the exhibit committee, announced that its purpose will be to acquaint Exposition attendees with the work that the A.E.S. Reesarch Program has accomplished and is currently doing. A great portion of the exhibit will be animated, will include graphs, charts and panels and will describe the current A.E.S. Research work that is being carried on in colleges and universities throughout the entire United States.

All the project directors are expected to be on hand to answer questions about the various aspects of their particular work. They will tell how they are progressing and what they hope to accomplish when the project is completed.

Other Interests

Other sidelights that will interest exhibitors and attendees are the facilities at the Stock Yard Inn, which adjoins the International Amphitheatre.

There are many rooms in the Inn which can be reserved by exhibitors for various conferences, dinners or sales meetings.

Eating facilities for those who do not wish to go into Chicago's Loop are numerous. There are four eating rooms, a tap room, and several dining rooms. There are smaller rooms where the management has agreed to serve food and drinks at nominal expense.

For those who prefer to "do it big"

(*Concluded on page 76*)

Dr. H. A. Gilbertson
Advisory Chairman for
1952 Convention

Ralph Wysong
St. Joseph Valley
Co-Operating Committeeman

Leonard Weeg
Rockford Branch
Co-Operating Committeeman

Shop Problems

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Dyed Phosphate Coatings

Question: Some time ago we read of a special type of phosphate coating that could be dyed different colors. We believe this would help us in our problem of identifying similar-looking parts having different thread sizes. Can you give us any further details about such a process?

R. A. W.

Answer: Under separate cover we are sending the names of firms who can supply such a process, which was widely used for just the same purpose as you have in mind. The dyeing of the film in no way affects the basic protection offered by the phosphate coating.

Rubber Bonding to Cadmium Plate

Question: Can you tell us how to go about getting good adhesion of rubber on a cadmium plated steel part?

D. A. P.

Answer: Brass has been the universal underplate for rubber bonding for many years. We have never heard of cadmium plating being used for this purpose. However, activity in the cements and rubber field has been very intense in the past several years, and perhaps a material is available that will enable you to do this job successfully. The names of firms who might be able to assist you are being sent and we suggest that you contact them for help with this problem.

Diamond Plating

Question: We have been trying to mount diamonds on a steel grinder plate by means of electroplating, but are having trouble in that the tools are not durable. Our cycle includes 1) Anodic cleaning 2) rinse 3) pickle in HCl. 4) rinse, 5) copper plate in the grit-containing solution for 2 hours at low current density 6) rinse 7) nickel plate for 4 hours, 8) rinse and dry.

Can you suggest a better method of doing this type of work?

B. J.

Answer: To get the benefit of the hardness and wear resistance of the diamonds it is essential that the diamond particles be imbedded in the *working surface* of the tool. How can this be possible when the diamonds are covered over with a 4 hour nickel plate? Re-surfacing the plate after nickel plating is vital.

Assuming that some sort of mechanical surfacing operation is performed on the nickel overlay so that the diamonds are brought to the surface where they can perform their function, it is then possible to attribute the poor wearing of the finished surface to the hardness of the nickel plating. If this nickel is too soft, it will wear away rapidly, leaving too much of the diamonds sticking up where they can readily be fractured and broken. The obvious remedy is to deposit a harder nickel for binding the diamonds. Another suggestion would be to apply a thin coating of chrome over the nickel *after* the plate has been surfaced to expose the diamonds. If a very heavy coating of chrome is wanted to supplement the action of the diamonds, it might be possible to remove enough of the nickel plating (after the surfacing operation) by electropolishing or chemical polishing. The amount of nickel removed can then be replaced by the hard chrome plating. A plate consisting of hard diamond particles surrounded by hard chromium metal should make an ideal wear-resistant surface.

Blistered Cadmium on Heat-Treated Parts

Question: Can you give us an explanation as to why the first run of barrel cadmium plated heat-treated parts will blister, yet when these are stripped and re-plated they come out perfectly? We are using a conventional cleaning cycle consisting of bulk cleaning, two rinses, dip in HCl, rinse, and cyanide wait tank.

Z. P.G.

Answer: Your problem is obviously tied in with the cleaning of the heat-treated surface. Without knowing the exact details of your alkaline and other cleaning steps (we wish people would quit referring to *conventional* cleaning methods—we haven't found any degree of standardization in this field!) it is impossible to put a finger on the exact cause. However, we suspect that you are probably electrocleaning the parts in metal baskets, where the basket itself is "robbing" all the current and is thus not effective in cleaning the parts. Tumble soak cleaning would be preferable. It is also very probable that you are not removing the thin heat-treatment scale *before* your alkaline cleaning operation. Some sort of a light pickle, or a barrel roll in sand or some other mild abrasive, should put the surface of the parts in a better condition for the actual cleaning cycle. Alkaline cleaning, either soak or electrocleaning, is not effective until this scale is removed. Even if the light scale can be removed in the after-clean pickle, there is still the danger that heat-treat oil that was trapped under the scale is still present to carry over into the cyanide soak, contaminating the surface sufficiently to prevent adhesion and cause blistering.

If the heat treatment consisted of case hardening (carburizing or cyaniding) then the parts must be handled like high-carbon steel, and special attention will have to be given to removal of carbide smut formed in the cleaning steps. This can be done in a reverse current treatment in a cyanide bath *after* the acid dipping step. It

may also be advisable to etch the surface of the parts sufficiently to give good adhesion. This can be done by anodic treatment in a weak sulfuric acid bath for approximately ½ minute, *after* the smut-removal step.

Plated Coatings for High Temperature Service

Question: We are considering the use of zinc or cadmium plated steel for use in a duct where the temperature averages 700-800°F., with flue gases present. Do you think that either of these materials will stand up under these conditions?

H. J. C.

Answer: We do not believe this application would be successful. Both metals oxidize readily at these temperatures, and if any condensation of moisture occurred in the presence of flue gases there would be fairly rapid deterioration of the coatings. We suggest some material like stainless steel or clad-steel for this type of job. There are also available a number of ceramic-type coating materials that could be used, but these usually suffer if continual heating-up and cooling-down are part of the normal cycle, because of the thermal expansion differences between the ceramics and the metallic base.

Corrosion of Chrome Plating

Question: We have experienced severe pitting and corrosion on a chrome plated shaft (.005" chrome deposit) where the shaft runs through some packing material and into the liquid chamber (water). When we made up this device we thought that chrome was the most corrosion-resistant plate that we could use, and we would appreciate any suggestions that you could make as to what other material we might try.

P. A. L.

Answer: You are right in believing that the chrome was an excellent material for this application, and we believe the trouble lies in the type of packing material used in the gland. Chlorinated-rubber seals and gaskets could cause rapid corrosion of the chrome plating, for instance. It is also possible that galvanic action is taking place. The usual clue to this is whether or not the corrosion is confined to the interface (or within a short distance of it) of the chrome plated shaft and the liquid. If the corrosion is taking place all along the shaft where it contacts the packing, the trouble probably lies in the packing material.

Reducing Trivalent Chromium in Chrome Baths

Question: Our chrome plating bath, used for decorative plating, has recently built up in trivalent chrome to a value of 6%, with a consequent loss in covering power. We have tried low current density dummy plating for 3 to 4 nights. We finally had to make up new solutions. Is there a practical way to eliminate trivalent chrome from spoiling future solutions?

J. G. C.

Answer: Reduction of trivalent chrome is quite a simple procedure, it being only necessary to work the solution at regular current densities with a large anode-cathode ratio, using lead alloy anodes. Trivalent chromium builds up because there is insufficient anode area in the tank for the amount of work being plated. Sometimes other anodes than lead are used, in which case the chromium that is reduced during plating is not re-oxidized either. Another common cause of trivalent chromium build-up is in hard chrome plating of internal areas, where it is not usually possible to provide sufficient anode area. Operating the bath occasionally overnight with a large number of lead anodes in the tank will keep the trivalent chromium down to a negligible value.

Removing Copper and Zinc from Chromium Baths

Question: We recently found by analysis that our chromium plating solution had built-up in copper to 2 oz./gal., with zinc at 1¼ oz./gal. Is there an economical method for removing these impurities?

M. W. K.

Answer: To the best of our knowledge there is no simple method for doing this, except possibly by ion exchange methods. At the present time aluminum is being removed from chromic acid anodizing baths vert satisfactorily, and it is reasonable to assume that the same technique would also remove copper and zinc. The present process involves dilution of the chrome solution first to reduce the chromic acid content to a value where it does not destroy the ion-exchange resin, then removing the metallic impurities, followed by concentration of the solution again to its working strength. The names of some firms who can give you further information on this subject are being sent.

In the absence of ion-exchange equipment, the only other remedy is to discard enough of the solution to reduce the metallic contamination to an acceptible value.

PROFESSIONAL DIRECTORY

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Recently Granted Patents
in the Metal Finishing Field

Patents

Setting up Polishing Wheels

U. S. Patent 2,579,727. *O. J. Carpenter, assignor to General Abrasive Co., Inc.*

The method of making a set up abrasive wheel which comprises rolling an adhesive coated wheel in a trough containing a layer of abrasive grains of substantial depth and during said rolling, causing penetration of the wheel into the layer of the grains by vibrating the trough at a preselected amplitude whereby the wheel is coated to the depth of penetration.

Buff Design

U. S. Patent 2,581,411. *F. E. Hendrickson, assignor to Murray Ireland.*

In combination in a composite buffing wheel, a hub having means providing a radially extending throat, a folded buffing section extending through the throat, the fold lying radially inward therefrom, and a rigid body lying in the fold supported thereby and movable therewith for enlarging said fold to prevent its passage outward through the throat to thereby retain said buffing section on said hub.

Electropolishing Copper Alloys With A.C.

U. S. Patent 2,582,020. *S. B. Emery, assignor to General Motors Corp.*

In a method for utilizing alternating current in electrolytic polishing operations, the steps comprising; providing a cathode taken from the class consisting of aluminum, tantalum and magnesium, positioning the cathode in a cell containing a polishing solution consisting essentially of an electrolyte taken from the class consisting of a saturated aqueous solution of ammonium phosphate, a saturated aqueous solution of ammonium phosphate mixed with a 5 to 50% citric acid solution, and a saturated aqueous solution of ammonium phosphate mixed with a 5 to 50% tartaric acid solution, providing work to be polished consisting of cupreous metals, and placing said work in the cell as an anode, and then supplying alternating current to the cell by connecting the output of a transformer to said cathode and said anode, whereby the cathode films and permits only unipolarity current to flow through the electrolyte for polishing the work.

Belt Polisher

U. S. Patent 2,578,662. *S. Bader.*

A polishing and granding machine comprising a pair of rollers, means rotatably mounting said rollers with the axis of one roller spaced from the axis of the other roller, means for driving one of said rollers, a contact roller having a relatively soft, cushioned outside surface, means rotatably mounting said contact roller with its axis spaced from the axes of said other rollers, said mounting means for said contact roller including means for rotating said contact roller about an axis substantially perpendicular to a plane passing through said axis of said contact roller and intermediate said axis of said contact roller and a plane passing through said axis of said pair of rollers, and an endless abrasive belt mounted on all three of said rollers.

Gas Plating Continuous Strip

U. S. Patent 2,580,976. *H. A. Toulmin, Jr., assignor to The Commonwealth Engineering Co. of O.*

Apparatus for plating a metal strip comprising a housing having inlet and outlet means for said metal strip, means for fluid-sealing said inlet and outlet means, substantially vertical partitions in said housing dividing said housing into separate chambers, means for conveying said strip through said housing, inlet means for circulating gas in a first chamber, conduit means connecting alternate chambers with said first chamber forming a first series of chambers, outlet means for the gas circulated in said first series, inlet means for conducting volatile metal compounds into the second chamber, conduit means connecting an alternate chamber with said second chamber forming a second series of chambers, outlet means for the metal compounds conducted in said second series, electrical contact means for conducting electric current to said moving sheet and impressing an electric potential on said sheet to increase the temperature thereof in one of the chambers of said first series for producing annealing temperatures in said strip and electrical shunt means for reducing the amount of current passing through said sheet in said second series and thereby reducing the temperature of said sheet following annealing.

Zinc Coating Process for Aluminum

U. S. Patent 2,580,773. *S. Heiman, assignor to Philadelphia Rust-Proof Company.*

The method of coating aluminum articles with an adherent smooth deposit of zinc which comprises cleaning the aluminum article to remove substantially all of the surface oxide film and immersing the cleaned aluminum article in an aqueous bath consisting essentially of water, a water-soluble zinc salt and a water-soluble fluoride, the concentration of the zinc salt in said bath being in the range of 3 N to 7 N and the concentration of the fluoride being in the range of 0.2 N to 2.5 N.

An immersion aqueous bath for depositing metallic zinc on a clean aluminum surface substantially free of surface oxide film which consists essentially of water, a water-soluble zinc salt and a water-soluble fluoride, the concentration of the zinc salt in said bath being in the range of 3 N to 7 N and the concentration of the fluoride being in the range of 0.2 N to 2.5 N.

Continuous Plating of Strip

U. S. Patent 23,456. *E. W. Rieger, assignor to National Steel Corp.*

In apparatus for progressively electroplating strip, the combination comprising, a tank for holding a bath of electroplating solution, means for moving the strip along a horizontal path across the tank from the entry end to the exit end whereby the moving strip drags electroplating solution in the direction of strip travel, means for supplying electroplating solution to the tank, an electroplating anode disposed in said tank below the path of the strip, said tank having a bottom wall, side walls extending upwardly from the bottom wall above the path of the strip across the tank for preventing spillage of electroplating solution across the side walls, an entry end wall extending upwardly from the bottom wall toward the path of the strip and terminating below the path of the strip and below the side walls, said tank being free of means preventing the spillage of solution across the top of the entry end wall and said entry end wall forming a discharge weir for the solution at the entrance end of the tank, and an exit end wall at the exit end of the tank extending upwardly from the bottom wall toward the path of the strip, said strip moving means comprising a pair of strip engaging rolls including an upper roll and a lower roll adjacent the discharge end of and positioned outside of the tank, one of said rolls being a contact roll for making electrical contact with the strip, means for connecting the contact roll and the anode to a source of electric current, sealing means extending between each of the side walls of the tank and the rolls and sealing means extending between at least one of the rolls and the exit end wall of the tank, the sealing means with the rolls preventing the spillage of electroplating solution from the exit end of the tank so that substantially all of the spillage of electroplating solution from the tank is across the entry end wall in a direction countercurrent to the direction of strip movement across the tank, and means [extending beneath] *at* the entry end of the tank for collecting the electroplating solution spilling over the entry end wall of the tank.

Buffing Wheel

U. S. Patent 2,582,076. *W. F. Sheppard*

In a buffing wheel, the combination with a central shaft, of a plurality of sections of substantially similar construction mounted on the shaft and held by axial pressure applied by members at the respective ends of the shaft and between which the sections are confined, each section comprising a disc, a plurality of fingers stamped from each disc, being disposed around the periphery thereof and having a substantially keystone shape in plan, each finger when bent having a spiral formation to retain a tuft of stranded material, said bent fingers alternating on respective sides of each disc, whereby the sections interlock when assembled by each finger being disposed between two fingers on an adjacent disc, and whereby said axial pressure directed against the spirally bent fingers increases the holding pressure of the fingers in retaining its tuft of stranded material.

Method of Silver Coating

U. S. Patent 2,583,581. *H. S. Lukens, assignor to the United States of America.*

A process of forming a thin non-porous coat on a metallic base, comprising depositing a porous silver coat of a thinness of less than about .0015 inch on said base, immersing said coated base as an anode in an electrolytic solution capable of electrochemically forming with said silver a water-insoluble fusible silver salt having a lower melting point than said metallic base and silver, passing an electric current through said anode and through said electrolytic solution until said porous silver coat has been partly converted into a water-insoluble silver salt, and heating the surface of said coated base to at least the melting point of said silver salt but below the melting point of said metallic base and of silver, whereby said silver salt is melted and flows into the pores of said thin porous silver coat and conjointly therewith forms a thin non-porous coat on said base.

Buffing Wheel

U. S. Patent 2,582,506. *L. B. Sax and T. H. Kingsbury.*

A centerless buffing section coprising an annular strip having inner and outer cylindrical surfaces, a plurality of layers of buffing fabric gathered on a supporting strand and wound spirally in the form of a ring extending outwardly from the outer peripheral surface of said strip, a plurality of tongue members extending outwardly from the opposite edges of said strip defining said surfaces and cooperating with said strip to form a circular channel within which said strand and said buffing fabric are received, and a plurality of spaced tongue members integral with said strip extending in a direction axially thereof, said tongue members being offset inwardly adjacent their respective bases and providing outer faces adapted to underlie and engage the inner surface of a similar adjacent buffing section.

Hard Anodic Coating for Aluminum

U. S. Patent 2,584,000. *C. Sonnino.*

In a process for the production of transparent and hard coatings on aluminum and its alloys the step which comprises making said metal the anode in an electrolytic bath consisting essentially of about 84 parts by weight of water, 15 parts of sulphuric acid and 1 part of beryllium sulphate.

EXPOSITION AND CONVENTION

(*Concluded from page* 72)

and have steak for the four days. *Jim McQuigan*, Stock Yard Inn manager, who personally selects all the steaks for the Sirloin Room, promises he will have many choice cuts on hand.

Accomodations and Transportation

Hotel accomodations are good. There are many rooms for those who wish to be near the exhibits and be on the floor promptly when the convention doors open.

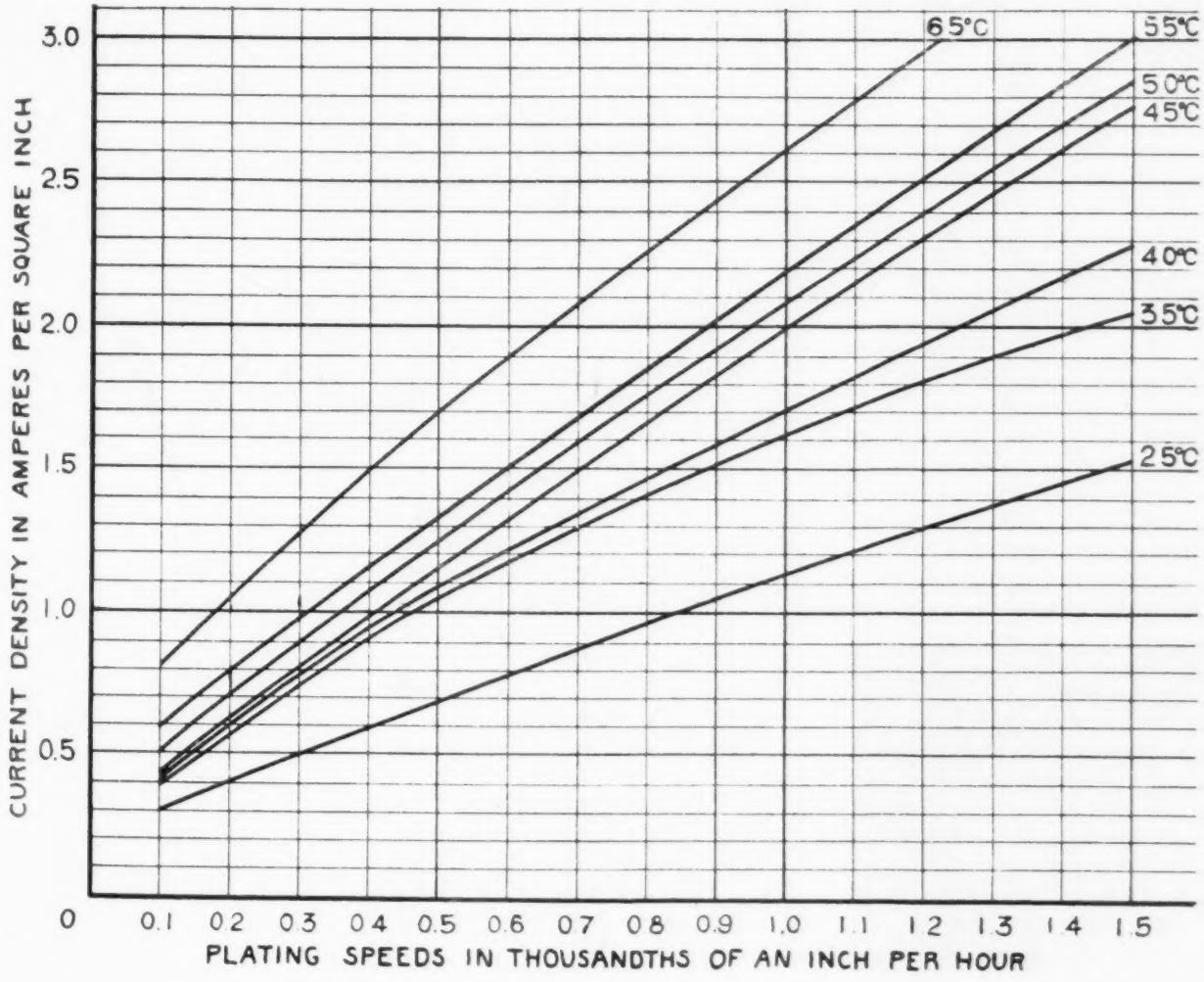
Free bus service will be provided to and from the Conrad Hilton Hotel, (formerly the Stevens) and the International Amphitheatre for all convention registrants and exhibitors at the Exposition.

It is just a 20 minute drive from Chicago's Loop to the International Amphitheatre. For those drivers, there is ample parking space for 4,000 cars in the Amphitheatre parking grounds.

With these facts in mind the Industrial Finishing Exposition will take its place along side the two other great shows to be held in 1952 at the Amphitheatre—the Democratic and Republican National Conventions.

Calculating Chromium Plating Speeds

The chart below gives average plating speeds for a bath containing 250 gm. l. of chromic acid, and a chromic acid-sulfate ratio of 100 gm./l. at various current densities and temperatures. Plating speeds for the 400 gm./l. chromic acid bath are slightly lower for the same current density and temperature. (See June Data Sheet).



Recent Developments

New Methods, Materials and Equipment for the Metal Finishing Industries

New Abrasive Belt Design

Minnesota Mining & Mfg. Co., Dept. MF, 900 Fauguier St., St. Paul 6, Minn.

The first major innovation in abrasive belt design in over 20 years—a serrated-edge grinding belt—was announced recently by the above firm.

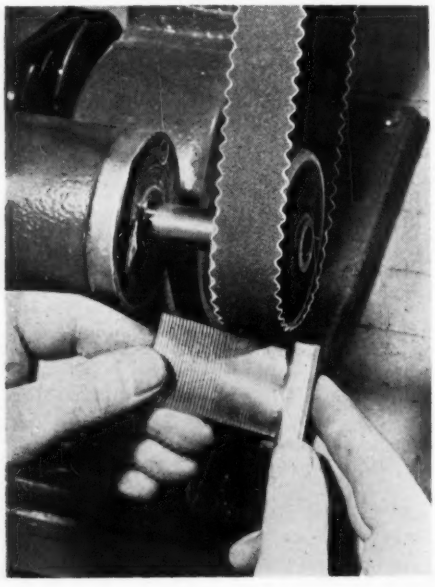
Introduced as the "3M" brand "Scallop-Edge" abrasive belt, it is designed for automatic precision grinding and finishing of jet turbine and compressor blades in a single operation, and is described as "an immediate solution to a bottleneck in jet aircraft production."

In addition it is expected to find wide application in the metalworking industry—in the manufacture of hand tools, cutlery and other operations involving small-radius grinding and filleting that was previously done by hand.

In use, the scallops of the belt curve around the edges of the contact wheel, allowing fillet areas to be polished on the edge-contour of the wheel.

In jet blade grinding two separate steps were previously required to finish-grind each of the more than 2,000 blades in a jet engine—the foil grinding and the root grinding.

Use of the new "Scallop-Edge" belt on an automatic grinder makes it possible to produce a completely precision-finished turbine blade in a single machine operation requiring only half the time and completely eliminating any hand finishing. It reduces the finishing cost per blade by 20% to 50% varying with the production line method, the firm said.



The belt is used on crowned, contoured or rounded-edge wheels, or with shaped back-up supports, and can be used either by machine or by hand. It is available on 15-day delivery in all standard abrasive belt constructions.

Steel Phosphating Compound and Brass Electrocleaner

The Diversey Corp., Dept. MF, 1820 Roscoe St., Chicago 13, Ill.

The firm announces addition of two new products to its line of cleaners used in preparing metal surfaces for finishing operations — Diversey Divobond for phosphatizing iron and steel prior to painting, and Diversey No. 101 for electrocleaning brass prior to plating.

Divobond is the result of seven years of research to develop a superior phosphatizing material, it is claimed. Divobond forms a thin but extremely tough skin on iron and steel which retards rusting of the clean metal prior to painting, promotes better paint adhesion and prevents flaking and peeling, according to the firm.

Diversey No. 101 is a new alkaline material developed specifically for electrocleaning of brass prior to plating. It has excellent detergent and emulsifying properties, will not stain or darken brass. Superior water softening action of the compound eliminates film in solution and rinse tanks.

To obtain full technical information on Divobond and Diversey No. 101, write to the above address.

Heavy Duty Vapor Steam Cleaner

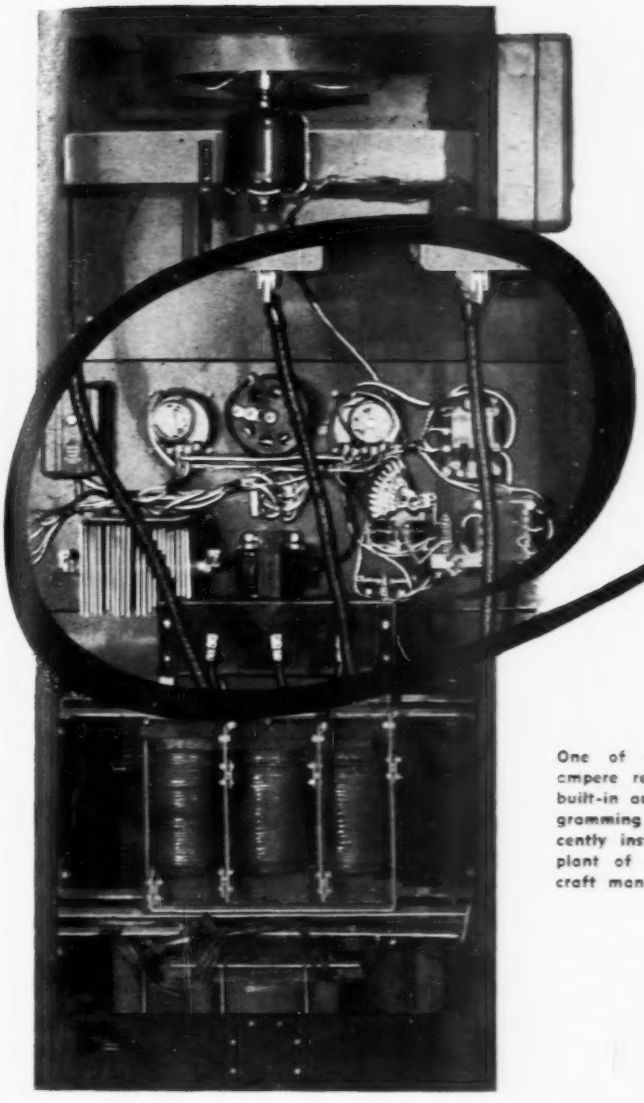
Topper Equip. Co., Dept. MF, Matawan, N. J.

A new, heavy-duty type steam cleaning machine for general industrial uses has just been announced by the above firm, manufacturers of Circo vapor degreasers, solvent recovery stills and degreasing solvents.

A fully automatic, safety protected system enables one-man operation while at the same time accelerating the cleaning process. At the snap of a switch a spark is generated which ignites the burner and puts the machine in action. From this point on, fully automatic controls maintain the operation at its peak, thus eliminating time-consuming adjustments.

The Circo is ready for action almost instantly, the maker states—a full operating pressure being generated within 90 seconds. There are no delays necesesary — no waiting to check proper burner adjustment, no settings to watch. The entire system is automatically protected from excessive pressures at three independent points. A mechanical outside safety valve is provided as a check on the electrical limit switch and by-pass valve. Heating coils are protected by a special control which stops entire unit should the water supply fail or become inadequate, thus obviating any possibility of burning out the heating coils. And finally the entire electrical system is protected by a conveniently located over-load switch.

Complete details are available on request.



RECTIFIER *with a mind of its own!*

One of several 250-ampere rectifiers, with built-in automatic programming controls, recently installed in the plant of a large aircraft manufacturer.

SET a few dials . . . press a button . . . and this compact unit carries out a complete anodizing program *without further attention.*

Output voltage gradually builds up in a series of precisely timed increments. When the desired dwell voltage is reached, it is held constant, during the final stage, by a saturable reactor stabilizer.

Such automatic plating controls soon pay for themselves in greater production, improved quality, fewer rejects, lower labor costs.

Where in *your* plant can automatic programming . . . voltage stabilization . . . periodic reversing . . . or other *RAPID ELECTRIC* rectifier controls be *profitably* applied? One of our engineers will gladly consult with you, make recommendations—without obligation. *Write to us today.*

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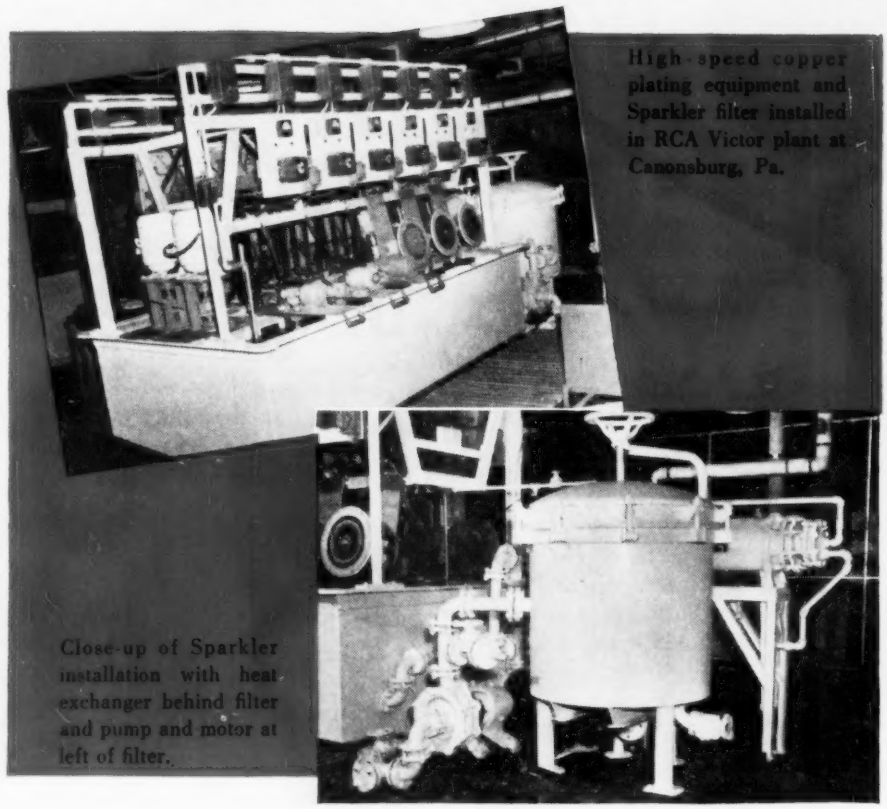


High-speed copper plating equipment and Sparkler filter installed in RCA Victor plant at Canonsburg, Pa.

Close-up of Sparkler installation with heat exchanger behind filter and pump and motor at left of filter.

Sparkler filters installed in the Radio Corporation of America's phonograph record plants are one of the reasons why all RCA Victor recordings so faithfully reproduce the tone and quality of the original sound.

Here's why: One of the initial steps in this manufacturing process is the production of a large number of molding dies. The first die is made by electroforming an exact negative of the original soft lacquer recording; then, other electroforming operations produce the additional dies needed.

Since the smoothness of the grooved surfaces is one of the factors that determine the amount of noise produced by the record when played, and since any foreign particles in the plating solutions will introduce roughness into the electroformed parts, it is obvious that extremely clean nickel and copper plating solutions must be obtained.

Sparkler handles this job easily, because the horizontal plate principle is especially designed to provide finest quality filtration under all types of operating conditions. Operators know that there is never any variation in quality with a Sparkler filter, even under fluctuating pressures or intermittent operation, since filter cakes are built up uniformly on horizontal plates. High flow rates, easy cleaning, complete portability, extremely low maintenance and operating costs, and minimum "down-time" — are other Sparkler features "tailor-made" for the plating industry.

Contact your Sparkler representative today, or write Mr. Eric Anderson for full information or engineering assistance.

SPARKLER MANUFACTURING COMPANY, Mundelein, Illinois

Sparkler International Corp.
Herengracht 568, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill., U.S.A.

Manufacturers of fine filtering equipment for more than a quarter of a century

Grinding and Polishing Machine

The George F. Grant Co., Inc., Dept. MF, West Newton 65, Mass.

This firm announces the development of a versatile grinding, finishing and polishing unit. Available in two models, the UM-60, 2½" x 60" and UM-45, 4" x 60". (The UM-60 is shown herewith.)

This unit was designed to meet the problems presented in today's production of small parts that must be ground, finished, polished, deburred, etc. off-hand. Employing the contact wheel method of coated abrasive belt polishing, this new unit also features platen supported belt grinding, concave and convex contour grinding and polishing and ¼" to ½" radius grinding and polishing, plus internal grinding attachments capable of doing areas from ⅝" up to 2" I.D.

Mounted on a fabricated steel cabinet base, the Grant Universal Grinder can be rotated 360 degrees with automatic locking at every 90 degrees. In addition to this feature, the unit has three standard positions of operation —(1) vertical, (2) horizontal, (3) perpendicular, thus making it adaptable to any type of any off-hand operational requirement without expending valuable production floor space.

Brochure, prices and parts list will be forwarded in response to general inquiry with special attention given to inquiries dealing with stated individual finishing problems.

Cyclothene Plastic Piping

Munray Products, Inc., Dept. MF, 12400 Crossburn Ave., Cleveland 11, O.

This tough, durable but semiflexible piping is highly resistant to a wide variety of solvents and is unaffected by mineral acids, salts and alkalies at temperatures up to 150°F. It is also

unaffected by temperatures as low as -50°F. and retains all its properties through repeated freezing and thawing, it is claimed. It is completely free from electrolytic corrosion.

Because it is highly resistant to chemicals it is excellent for sewage and acid drainage use, for fume piping and for corrosives. Its fine electrical properties fit it for use as conduit.

Made in all sizes from ½" to 6", Cyclothene pipe is furnished in stock lengths of 25 ft. in 4" or larger pipe, 150 ft. coils for 3" pipe, 250 ft. coils for 2" pipe and up to 400 ft. in smaller sizes. Because of the long lengths and because its semi-flexible construction permits it to follow surface contours and to be bent, installation costs are very inexpensive. A hack saw and screw driver are the only tools used for installation.

Aluminum Sheet "Cleanliness" Tester

J. W. Dice Company, Dept. MF, Englewood, N. J.

One troublesome factor in the welding of aluminum sheet is the so-called "cleanliness" of the sheets as presented to the welding head. The surface electrical resistance, in microhms, is a measure of the effectiveness of the oxide removal or cleaning process employed.

The new Model 151-S Microhm Meter can readily measure the total surface resistance of two sheets, or coupons, when placed between two dummy electrodes. It can accurately measure a resistance as low as one millionth of an ohm (.000001 ohm), and the readings are practically instantaneous. The instrument scale is 0-75 microhms and is linear. If it is

necessary to read higher resistance values than 75 microhms, a selector switch cuts in various multipliers which permit taking measurements up to 750,000 microhms.

The instrument is a shop, or service

Are you SURE you're using THE MOST EFFICIENT FINISH?

If your production involves finishing zinc, cadmium, aluminum or cuprous metals, you owe it to yourself... and your customers... to investigate

IRIDITE®

for on any of these metals Iridite gives you a high performance finish at a low cost from a simple chemical dip.

IF YOU WANT HIGH CORROSION RESISTANCE, you'll find an Iridite that will meet any military or civilian specifications for chromate finishing.

IF PAINT ADHERENCE IS IMPORTANT, you'll find Iridite prevents underfilm corrosion and soap formation.

OR, FOR BRIGHT, DECORATIVE FINISHES—

investigate zinc plate and Iridite (Bright) for a chrome-like decorative finish with more corrosion protection than conventional chrome plating . . . or Iridite (Metcote) as a treatment for copper that eliminates the need for buffing in the copper-chrome system; produces a sparkling bright finish!

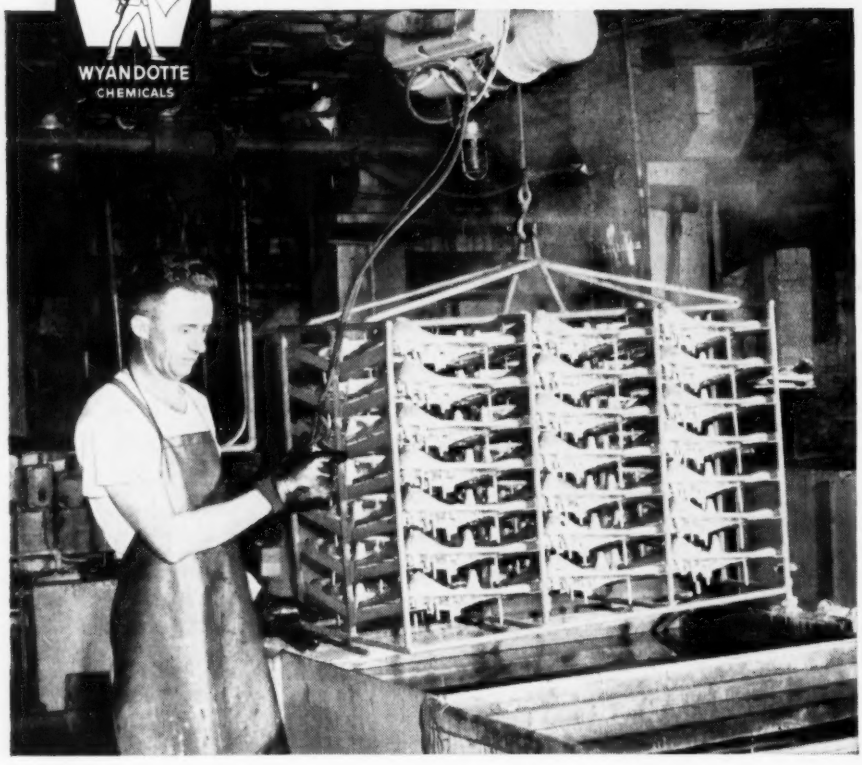
Write for literature and send us samples for test processing. See "Plating Supplies" in your classified telephone directory or write direct.

Iridite is approved under government specifications.

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Brighteners.
West Coast Licensee: L. H. BUTCHER COMPANY

Specialists in Industrial Cleaning Products



W. H. Pape, of the V-M Corporation, says:

"Wyandotte specialized cleaners and on-the-job service invaluable to us"

"WE PRIDE ourselves on our complete facilities for production of automatic record changers and allied electro-mechanical devices," states Mr. W. H. Pape, of the V-M Corporation, Benton Harbor, Michigan, a leader in its field.

"Our organization has grown from 15 people in 1944 to more than 750 today. It was built on our ability to produce high quality at attractive prices. This necessitates rapid design changes, quick production change-overs, and proper metal-cleaning practice for all metal parts.

"Since our beginning, we have depended on Wyandotte specialized products for most of our metal-cleaning needs. By working closely with a Wyandotte Service Supervisor, we get top results and eliminate costly shut-downs.

"Currently, we are using Wyandotte W.L.G.* and B.D. in our various operations because they meet our rigid quality-control requirements."

How about your metal-cleaning operations? This same Wyandotte service is available to you without charge or obligation. And Wyandotte offers you the finest line of specialized cleaning compounds in the world. *Wyandotte Chemicals Corporation, Wyandotte, Michigan; also Los Angeles 54, Calif.* *REG. U.S. PAT. OFF.

CLEANING THE WORLD

Largest manufacturers of specialized cleaning products for business and industry

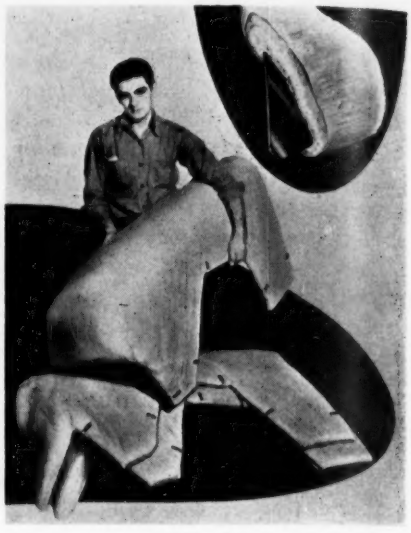
Wyandotte CHEMICALS

Helpful service representatives in 88 cities in the U.S. and Canada

type instrument designed for maximum ruggedness and reliability. It is contained in a heavy oak case with waterproof finish. Total weight, including internal battery power supply, 22 lbs.

Wrapping to Protect Plated Parts

Cadillac Products, Inc., Dept. MF, 2300 Gainsboro, Ferndale 20, Mich.



An improved cushion-type, patented wrapping for protecting large or oddly formed parts or products from in-transit and storage damage is announced by this firm. Trademarked under the name Cadwrap, it consists of sheets of heavy, tough, crepe paper between which are fastened cushioning layers of excelsior. The integral wrapping is then tailored to fit each part or product and is usually held in place by another patented device known as Cadclips, which permit easy nesting and handling of oddly formed units.

pH Meter Features Compactness, Portability

Beckman Instruments, Inc., Dept. MF, South Pasadena 9, Calif.

The above firm, one of the world's largest manufacturers of electrometric pH equipment, has recently announced development of an entirely new battery-operated pH instrument incorporating a number of revolutionary advancements that insure greater convenience and all-around adaptability in plant and field applications. Known as the Beckman Model N pH Meter, this new instrument is light in weight, unusually compact and amply rugged to be used anywhere—in the field, in the plant, in shops, mills or laboratories—without dependence upon outside power circuits.

It can be used vertically or hori-

zontally, has high accuracy, low operating cost, and is one of the most rugged pH instruments available.

Two versions of the Model N pH instrument are offered—the Model N-1 is the basic instrument supplied complete with electrodes, buffer KCl solution and beaker—and the de luxe Model N-2, which includes an auxiliary carrying case that folds up integral with the instrument itself to provide a completely portable unit containing electrodes, buffer, beaker, thermometer and all other necessary accessories in one convenient unit. Complete information on the new Beckman Model N may be obtained by writing.

Self-Contained Chrome Plating Machine

Industrial Chrome Div., Dept. MF, Ward Leonard Electric Co., Mount Vernon, N. Y.

A 250 ampere Chromaster unit has been added recently to the Ward Leonard line of industrial chrome plating equipment. This new production tool is designed for industrial chrome plating small tools or parts with areas up to 125 sq. in. With Chromaster and Chromasol, this firm's tional new chrome plating solution, normal life of cutting tools, wear parts and dies can be increased up to ten times, it is claimed.

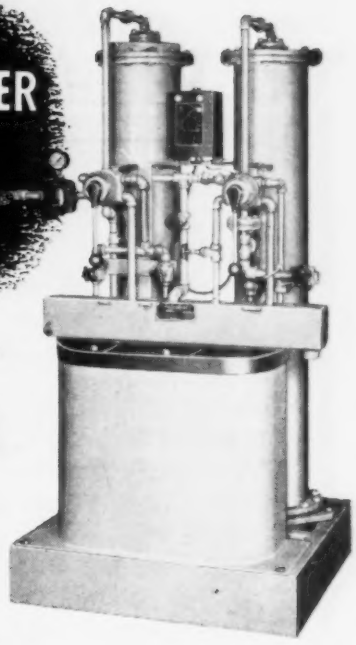
Individual floor-mounted plating tank and power unit are designed to minimize installation costs and to conserve plant floor space. Power unit contains a built-in selenium rectifier complete with instrument panel and controls for accurately regulating the rate of chrome deposit.

Industrial chrome plating with Chromaster and Chromasol is fast, economical and simple in operation. Average plating time is 3½ minutes for

CHEMICALLY PURE WATER *is Cheap*

only a few cents a thousand gallons

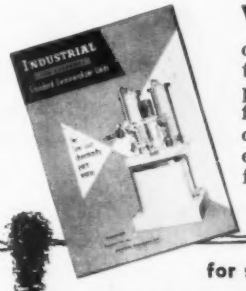
with **INDUSTRIAL**
Water Demineralizers



A two-bed INDUSTRIAL demineralizer unit. Standard units are available with capacities of 200 to 1000 gph. Special units of any capacity are engineered to requirements.

Eliminate UNWANTED PRECIPITATES
HOT WATER RINSE STAINS

These two difficulties in plating can be eliminated with one stroke—chemically pure water. Pure water in plating solutions improves the over-all quality of plated coatings. The use of pure water for hot rinses prevents stains and water marks after drying. With an INDUSTRIAL demineralizer chemically pure water costs so little that the unit pays for itself in a short time. It's easy to install and operate, and requires very little floor space.



Write for Bulletin 200
or send us a water analysis, letting us know the amount of treated water required in gallons per hour, and whether intermittent or continuous flow is needed. We will then give you the whole demineralizer story, including estimated cost, equipment required, performance data, etc. for your requirements.

for solution clarification . . .

INDUSTRIAL Filters

A typical INDUSTRIAL stationary filter. Standard portable and stationary models are available with capacities 100 to 15,000 gph. Special filtering systems are engineered to meet unusual requirements.

Write for Full Information and Recommendations

FILTERS Pressure Type · PUMPS Centrifugal · CORROSION TESTING APPARATUS Salt Fog • Humidity

INDUSTRIAL FILTER & PUMP MFG. CO.
5906 Ogden Avenue
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RUBBER DIVISION Vulcanized Linings • Molded Products · WATER DEMINERALIZERS

GET PHYSICALLY CLEAN SURFACES

By Precleaning with MAGNUS EMULSO-CLEAN!

THE MAGNUS EMULSO-DIP METHOD OF PRECLEANING

Work to be precleaned is dipped into (or sprayed with) the Magnusol cleaning solution...made up of Magnusol concentrate and kerosene or safety solvent. The solution rapidly wets and penetrates the dirt on the work, loosening it so that it is completely flushed off when rinsed with water, steam or safety solvent. Not only oil and grease, but all solid dirts, including metal particles, are removed. In many cases it is not necessary to heat the cleaning solution or the flushing water. The solution is nontoxic, non-inflammable and harmless to all metals and to the skin.

Remove not only oily, greasy dirt, but all solid particles as well. With the Magnus Emulso-Dip method of precleaning, your work goes to the final cleaning operation physically clean . . . with the job of the final operation concentrated on giving you a *chemically* clean surface, ready for reject-free plating. The Magnus Emulso-Dip process does all that chlorinated solvents can do . . . and more . . . because it removes solid dirts as well as oils and greases. It is based on always available Magnusol and safety solvents. It means no hazards to personnel . . . no attack on equipment . . . no danger to the work.

SEE IT WORK!

. . . either in the Magnus Testing Laboratory or through a demonstration in your own plant. Ask us for details.

MAGNUS CHEMICAL CO. • 11 South Ave., Garwood, N. J.
In Canada—Magnus Chemicals, Ltd., Montreal.
Service representatives in principal cities.

Magnus
CLEANERS • EQUIPMENT • METHODS

cutting tools; chrome cost averages just a few mils in most applications; complete operation requires only five basic steps. Complete details on request.

Barrel Burnishing Powder for Copper Alloys

Blue Magic Chemical Specialties Co., Dept. MF, 2135 Margaret St., Philadelphia 24, Pa.

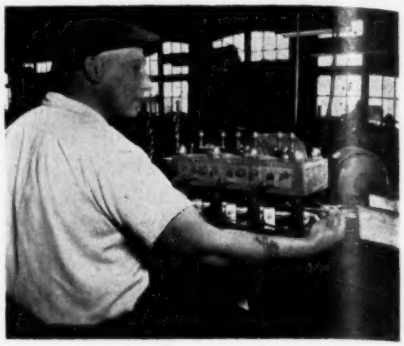
Especially developed to impart excellent color and fine finish to copper, brass, bronze and copper alloy stampings, castings and other parts that can be barrel tumbled, Blue Magic Burnishing Compound No. 11 is said also to work very well with certain die casting materials, including slush metals, also is a good cleaner, degreaser and rust remover.

The compound is a free-flowing powder, light in color, fast in operation and low in cost. It may be used with any coated abrasives, quarried stones or other abrasives as well with steel balls, shapes and other generally used burnishing media.

The manufacturer further states that detergency and rinsibility are outstanding characteristics and that parts leave the barrel free from chips, abrasives, sludge, oil traces or any other foreign matter that might impair subsequent plating or other operations. For more details ask for Bulletin No. 11. Samples for test runs and company laboratory facilities are offered without charge.

Tube-Straightening Machine Does Not Mar Surface

Mackintosh-Hemphill Co., Dept. MF, 901 Bingham St., Pittsburgh 3, Pa.



Elimination of spiral marking, created in the straightening of high brass tubing, was secured by *The Mackenzie Walton Co.* after installing a modern rotary straightener in its factory at Pawtucket, R. I.

In addition to defacing the finish of the 70-30 high brass tube, the former method of straightening required excess manpower for efficiency and the ultimate tensile strength of the tubing was difficult to maintain.

Since the installation of the Model AY rotary straightener, seen above, there is no objectionable marking on the non-ferrous seamless tubing, but a valued burnishing effect is sometimes created, according to the firm. This makes subsequent finishing and plating operations much more economical, it is claimed.

This machine, made by Mackintosh-Hemphill Co., Pittsburgh, works to such close tolerances that the firm has been able to meet its customers' most exacting specifications, including some never before attempted, it is claimed.

Dynel Work Clothes Tough Enough to be Soaked in Acid

Carbide & Carbon Chem. Co., Dept. MF, 30 E. 42 St., N. Y. 17, N. Y.

Dynel, new textile fiber now rounding out its first year of commercial production has gained wide acceptance in industrial uniforms and other work clothing, particularly for use in chemical and petroleum plants. Five important garment manufacturers are now offering this clothing.

The fiber's great resistance to corrosive action by chemicals is dramatically shown by the fact that dynel work clothes can withstand splashing by most acids and alkalis without harm. Cloth of the same fiber is used in

filters where it soaks for weeks in similar corrosive chemicals.

Dynel's combination of properties bring great improvements to work clothing. In addition to the fiber's toughness and resistance to acids, it provides garments that are good looking and comfortable. It can be woven into fabrics warm for cold weather or cool for hot. It has exceptionally long laundry life, is unaffected by harsh soaps and detergents commonly used to clean industrial garments. Dynel is stain resistant, can be disinfected in strong bleaches with no effect on fabric strength. Virtually shrinkproof, it dries quickly, requires no ironing, can be worn again in a few hours.

Dynel work clothes have been thoroughly tested in a number of industries; electro-plating, storage battery manufacture, oil refining and plants producing or handling such corrosive chemicals as sulfuric acid.

Universal Hub Contact Wheel

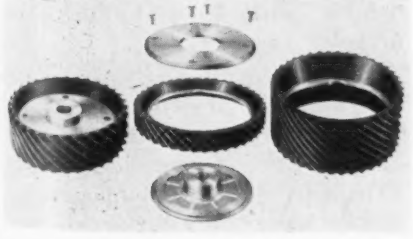
Carborundum Co., Dept. MF, Niagara Falls, N. Y.

A product which offers the possibility of halving contact wheel cost, and providing a completely new factor of versatility, was announced recently by the above company.

An entirely new concept, the Universal Hub contact wheel consists of a three-part bolted metal assembly which includes a flanged Universal Hub, a T-61 serrated rubber tire and a side plate.

The tire, when worn out, is discarded, and is replaced by a new tire at half the cost of a standard new contact wheel replacement. In this way, the user can cut his contact wheel replacement costs in half.

A single Universal Hub and plate unit will mount a variety of T-61 rubber tires of from ¼″ up to 6″ in width, and from 5 to 105 durometer in hardness. This feature of interchangeability means that a single Universal Hub will take up to 144 different tires of varying width and/or hardness. The interchangeable feature thus permits everything from rough belt grinding down to the finest finishes on flat surfaces or contoured parts, employing the same basic Universal Hub, without removing the Hub from the spindle. Tires can be changed in only a slightly longer time than that required to change a solid-hub contact wheel.



Explosion view of Universal Hub contact wheel. Assembly consists of Universal Hub, side plate and T-61 serrated rubber tire. Each part balanced so that assembled unit is in balance. Universal Hub and side plate will take up to 144 tires of varying width or hardness.

Each part of the Universal Hub assembly—hub wheel, plate and tire—is separately balanced. Thus, all hubs, plates and serrated rubber T-61 tires are not only interchangeable but are in balance in any combination of assembled contact wheel units. Carborundum points out that in those instances where old-type worn-out rubber contact wheels used to be recovered, it will now be more economical to discard the old tire, replace it with a new one. The new tire costs no more than the recovering of a solid-hub contact wheel, and time delays and shipping costs are eliminated.

These improvements have been achieved in such a way as to permit a *price reduction* on the complete 3-piece assembly of as much as 19% over the old-type wheel.

Lacquers for Silver Spraying

Doram Products, Inc., Dept. MF, 410 Frelinghuysen Ave., Newark 5, N. J.

The above company, coating special-

If you make a bath like this

...it's time you switched to NEW SILVER SOL-U-SALT

Note these advantages!

- High Purity eliminates harmful ingredients introduced to plating solution.
- No filtering necessary.
- Eliminates waste.
- No rough deposits.
- Dustless, eliminating hazard of other type air-borne powders.
- Does not affect the free cyanide content of the plating solution.
- Precalculated — 2 ounces avoirdupois of Silver SOL-U-SALT contains 1 troy ounce of metallic silver.

Available in 100, 200, 500, 1000 and 2000 ounce plastic packages.

SILVER SOL-U-SALT is a water soluble double cyanide salt. It is a pure white crystalline, free-flowing salt of known and definite chemical composition. Developed for making new Potassium Silver Cyanide plating solutions or for metal replenishment in existing baths.

No more dirt, dust, mixing, calculating or filtering!

An exclusive development of

Sel-Rex **SEL-REX PRECIOUS METALS, INC.**

Dept. MF-5 229 Main Street • Belleville 9, N. J.

ists to the metallizing field, both vacuum evaporation and silver spray, introduces its new line of materials to the trade. Doravac 17B and Dorasil 17B are coatings used for the metallization of cellulose acetate and cellulose acetate butyrate prior to and after metallizing. These materials possess excellent adhesive qualities, combined with high gloss and durability. They are thermosetting materials, hence do not become tacky. They will resist moderate exposure to mild solvents without becoming tacky.

Doramet 34 is a metal coating, equally good for white metal and for steel. Doramet 34 is a thermosetting material, tough, durable, flexible, and above all, possessing exceptional adhesive qualities. Its high solids content insures good gloss and reflectivity.

KS 75 is a coating for polystyrene. This material possesses excellent adhesion and will not attack the base material. KS 75 thermosets at 160°F. with fine gloss and toughness. A feature of this system is that polystyrene items, basecoated with KS 75, after metallization can be top coated with Doravac 17B. The advantage of such a system is that styrene and acetate can be run together, with styrene taking the non-attacking base coat KC 75.

Doram Products, Inc. possesses the distinction of having on its technical staff men who are intimately familiar with the individual technical processes involved in metallizing, namely vacuum evaporation and silver spray, along with their vast coating experience.

Plating Rectifier

Electronic Rectifiers, Inc., Dept. MF, 2102 Spann Ave., Indianapolis 3, Ind.

This firm has announced a new DC power supply that can be used for electroplating, cleaning, laboratory testing and many other uses where a dependable source of DC power is required.

The new unit operates on AC line voltages of 208 to 230, three phase 60 cycles. It supplies either 500 amperes at 3 to 7 volts DC, or 250 amperes at 6 to 14 volts DC. This is a full wave unit with a ripple voltage of approximately 4½% under load, it is claimed. The DC voltage does not drop to zero when a single tap position is changed under load as is common to many power supplies employing a three-phase, half-wave rectifier.

The unit is equipped with "Lektron" magnesium copper sulphide rectifiers that can be operated at temperatures from 40° to 284°F. The unit is said not to be affected by atmospheric conditions and over a long period of time has been proved to be rugged mechanically and electrically.

Cabinet size for the DC Power Supply is 17" x 17" x 45", and includes an AC contactor with thermal overload relays and an on-off switch; DC voltmeter; DC ammeter; three current selector switches; and convenient DC terminal panel.

Rigid Polyvinyl Chloride Fabrications

American Agile Corp., Dept. MF, P.O. Box 168, Bedford, O.

Agilide, a rigid polyvinyl chloride exhibiting exceptional resistance against water, acids, alkalies, salt solutions, vegetable and mineral oils, and many other corrosive media, and offering very good physical properties, is now fabricated through a combination of extrusion, molding and plastic welding processes according to customer's specifications by the above firm.

Fabrications ranging from storage and chemical processing tanks and tank liners, pipe and duct lines, exhaust hoods and ventilators, to complete apparatus and equipment, previously made from high-grade steels and other expensive metals, are now available in Agilide, resulting in considerable savings due to greatly reduced maintenance and replacement costs.

Agitide is non-flamable and physiologically inert (odorless and tasteless) and the use of fabricated equipment and pipelines is recommended for applications where working temperatures do not exceed 170°F.

Wet Blast Chemicals

American Wheelabrator & Equipment Corp., Dept. MF, 1179 S. Byrkit St., Mishawaka, Ind.

A complete line of abrasives for wet blasting machines is available directly from stock, according to an announcement made by this firm. Sizes supplied range from 80 to 2,500 mesh, and they are packaged in convenient 50-lb. weights for easy charging of the machine and storage simplification. They are shipped in sturdy corrugated cartons which withstand rough handling. American Wheelabrator is also prepared to provide from stock all of the other chemicals needed for wet blasting. Anarust, the company's rust inhibitor, embodies two characteristics new to inhibitors: Being in liquid form it goes into solution immediately and it virtually eliminates the staining normally expected with inhibited water. Anaset, an anti-packing chemical, completes the company's line of wet blasting supplies.

Fog Spray Nozzle

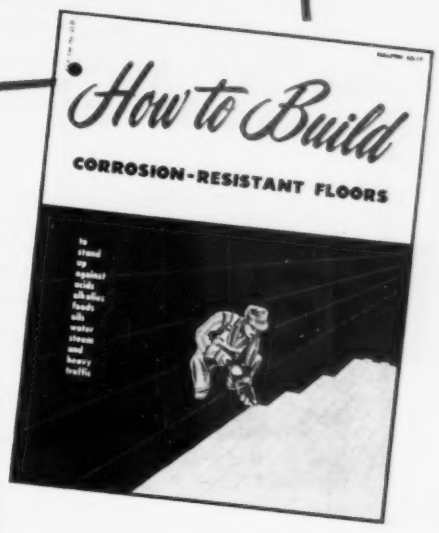
Bete Fog Nozzle, Inc., Dept. MF, 85 Pierce St., Greenfield, Mass.

A versatile fog spray nozzle with a handy three-foot applicator, positive shut-off, and garden hose connection has recently been developed by this firm. It is known as the HX5 nozzle.

The HX5 is well suited for a variety of industrial uses where a portable nozzle with carefully controlled spray pattern and volume are required. For example, it is excellent for cleaning, washing, applying chemicals, and for certain types of fire protection. It can also be used to advantage in the control of brush near buildings and sidings.

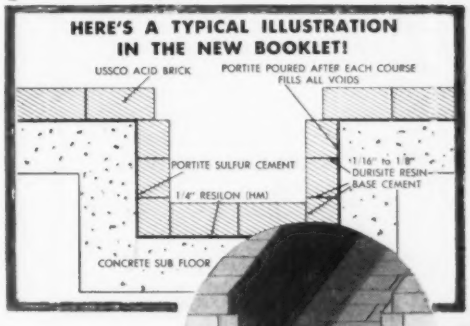
The atomizing elements of the unique HX5 nozzle are a series of interchangeable fan spray discs precision machined from solid stainless steel. Discs are available for fan angles from 10° to 90° with a 1/10 to 8 g.p.m. flow. The applicator is of lightweight aluminum tubing furnished straight or bent to a 30° angle. The HX5 nozzle operates at ordinary 30 to 100 p.s.i. pressures.

THE ANSWERS TO THESE QUESTIONS ON ACID-BRICK FLOOR CONSTRUCTION ARE YOURS FOR A THREE-CENT STAMP



- HOW TO LAY AN INEXPENSIVE, IMPERMEABLE MEMRANE.
- HOW THIN JOINTS CAN BE EASILY MADE.
- SHOULD YOU TRY TO GET BY WITH BUTTERING BRICK ON FOUR SIDES ONLY?
- WHAT'S THE SIMPLEST WAY TO BUILD A COVE BASE?
- CAN YOU SAFELY INSTALL AN ACID-BRICK FLOOR OVER AN OLD CONCRETE SUB-BASE?
- HOW TO SELECT THE RIGHT BRICK FOR THE JOB.
- ARE EXPANSION JOINTS NECESSARY?
- WHAT'S THE BEST CONSTRUCTION FOR PIERS? MOTOR SUPPORTS? TRENCHES?

The money-saving answers to these questions, and many more, are found in our new booklet "How to Build Corrosion-Resistant Floors." In its 16 pages you will find the full story on the construction of acid-and-alkali-resistant brick floors. Every detail is covered — every important point thoroughly described and discussed. Photographs, sketches, engineering drawings — all are used to give you a clear, concise picture. Get your copy today — it's free on request.


HERE'S A TYPICAL ILLUSTRATION IN THE NEW BOOKLET!
USSCO ACID BRICK
PORTITE POURED AFTER EACH COURSE FILLS ALL VOIDS
PORTITE SULFUR CEMENT
1/4" RESILON (HM)
1/16" to 1/8" DURISITE RESIN-BASE CEMENT
CONCRETE SUB FLOOR

Construction detail for deep trench

Write U. S. Stoneware Co., Process Equipment Division, Akron 9, Ohio.

Engineers, Manufacturers, Erectors of Corrosion-Resistant Equipment since 1805.

U. S. STONEWARE
AKRON 9, OHIO

339-C

Maximum Heat Transfer Now Possible With Half the Steel

Kold-Hold Mfg. Co., Dept. MF, Lansing, Mich.

Desired BTU transfer can now be achieved with a unit only half the size of those using conventional methods, according to the above firm. This unit, known as a Platecoil, has more than double the BTU capacity per square foot area of pipe coil. For instance, a 22″ x 19″ Platecoil, weighing only 95 pounds, has the same heating capacity as a 2″ pipe coil weighing 239 pounds. Use of a Platecoil this size saves 144 pounds of steel.

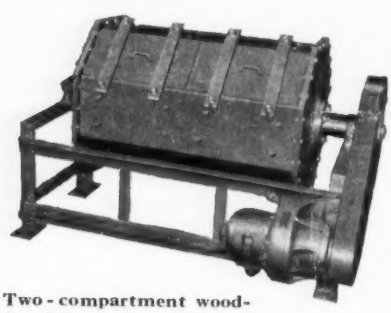
Platecoils require less steel because the heating solution flows in channels formed by joining the two embossed metal surface plates. Because of this construction, a plate type unit has more prime heating surface in a given area than can be obtained with pipe coil. As a result, a smaller, more compact Platecoil unit will heat a tank in less time. This construction also provides strength and rigidity which permits use of Platecoils in applications where conventional pipe coils are not adaptable.

Because less material is needed in their construction, the initial cost of Platecoils ranges 50% or more below

A TUMBLING BARREL FOR EVERY PURPOSE

Yes . . . Henderson can supply you with tumbling equipment in a variety of sizes, shapes and materials for practically every tumbling requirement. Nearly three quarters of a century in designing and manufacturing tumbling barrels for the GRINDING, BURNISHING, POLISHING and CLEANING of metal stampings, balls, bearing races, forgings, small castings, screw machine products, jewelry, wire forms and small metal parts. Tilting type barrels of Steel, Wood or Alloy Metal . . . Horizontal type barrels of Cast Iron or Cast Steel. Wood or rubber lined in all Models. Also special barrels for plastics.

#5A Motor Driven Tilting Oblique Tumbling Barrel.



Two-compartment wood-lined Burnishing Barrel.

If your requirements call for faster production and finer quality at lower cost or if you require Tumbling Barrels of special design, our Development and Engineering Service will be glad to make recommendations.

Write for further information.

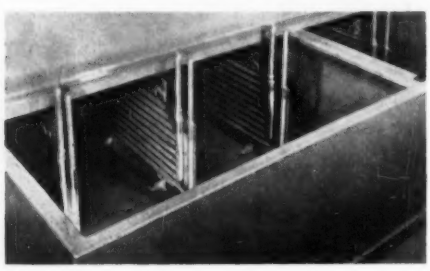
Since 1880 - Designers and Builders of Tumbling Barrel Equipment

THE HENDERSON BROS. COMPANY

135 SOUTH LEONARD ST. WATERBURY 85, CONN.

the cost of equivalent pipe coils. Installation costs are much less too, as no welding or pipe fitting is required. They are installed in a half hour or less by one man and a helper through use of quick-change hangers. When maintenance is required units are removed and replaced in a matter of minutes without dumping the contents of the tank.

According to the manufacturer, the Kold-Hold Manufacturing Company of Lansing, Michigan, Platecoils can be used wherever pipe coils are used throughout industry. In addition they have many applications not readily accomplished by pipe coils. Typical applications include the uniform heating of bonderizing tanks, parkerizing tanks, metal parts washers, industrial degreasers, acid pickling tanks, plating tanks, degreasers, and quench oil tanks.

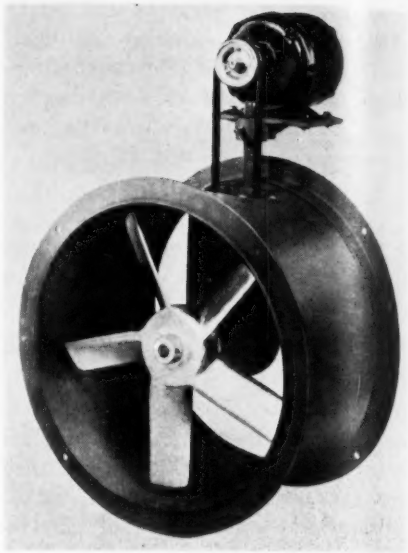


Information on the use of Platecoils is contained in a new 6-page bulletin.

Fan for Removing Hazardous Fumes and Vapors

Standard Electric Mfg. Co., Inc., Dept. MF, West Berlin, N. J.

For exhausting dangerous or obnoxious fumes, dirt, heat and smoke and other applications where it is desirable to have the motor outside the air stream, Standard Electric has brought out a general-purpose type fan combining a number of improvements. Explosion proof, enclosed or open type motors are available as required and this rugged unit meets UL specifications for spray booths. Features include sealed SKF bearings in readily replaceable flange construction, double angle motor support to minimize vibration, adjustable motor base for belt takeup, and heavy cast aluminum fan blade in a wide range of sizes from 18″ to 42″. From ¼ 7½ h.p. motors are also available as required. Manufactured in quantities, prompt deliveries, low cost. Catalog available.



Liquid Honing Equipment

Vapor Blast Mfg. Co., Dept. MF, 3025 W. Atkinson, Milwaukee 9, Wis.

Two new liquid honing machines will be shown at the Tool Show by the above firm, pioneers in wet abrasive blasting. These will be a new small tool room machine, and a larger machine with track and car for handling dies. A new, small, complete Vapor Blast liquid honing machine made especially for Tool Room is illustrated. It can be operated from either sitting or standing position.

Both of these machines are new designs developed for use in wet blasting tools, broaches, hobs, taps and drills and larger tools like dies and molds. Examples of actual tools, before and after Liquid Honing, will be shown together with reports of results from users.

Polyethylene Exhaust Systems

American Agile Corp., Dept. MF, P.O. Box 168, Bedford, O.

Exhaust systems for corrosive vapors and fumes, fabricated throughout from polyethylene are offered by the above firm. These installations, including tanks or tank liners, exhaust hoods, fume ducts and fume stacks, or any part thereof, are built to customer's specification.

Polyethylene exhaust and duct systems offer outstanding corrosion resistance against most acid fumes, including hydrochloric, hydrofluoric, sulfuric, and nitric acids. They are easy to clean and will outlive most other construction materials when used between 20°F. and 170°F., it is claimed.

The American Agile Corp. offers its vast experience in design, engineering, and fabricating in the field of polyethylene fabrications, and these extremely economical installations, which are said to require no upkeep such as relining, repainting, etc., are finding ever increasing use in the various chemical and allied industries.

For further information and details on Agilene (polyethylene) exhaust and duct systems and sections, write to the above address.

Lightweight Respirator Hood

American Optical Co., Dept. MF, Southbridge, Mass.

This firm announces that its "flyweight" respirator hood, designed specifically for dust and paint spray protection, is now being made with a new replaceable plastic window. The hood

is available with the company's R2000 seven interchangeable cartridge and disc filter respirator.

Formerly, the window of the No. 75 respirator hood was sewed to the hood and could not be detached for replacement. Now, with the aid of seven snap fasteners, the window can be easily and rapidly replaced.

The new replaceable window, the company says, provides a completely unobstructed frontal field of vision in addition to good, adequate side vision.

The hood has two drawstrings which tie under the arms, permitting a snug fit at all times. It is reinforced with leather for extra long service and fits any head due to an elastic strap sewn to the back of the hood.

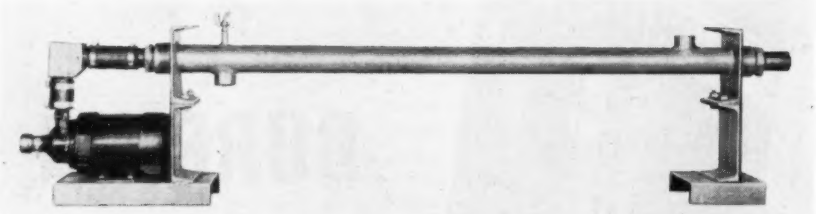
BUSINESS ITEMS

Electrochemical Industries to Handle Chelating Agents for Plating Industry

Electrochemical Industries, Inc., Jacques St., Worcester, Mass., announces that it has been designated as a manufacturers agent by the *Bersworth Chemical Co., Framingham*, Mass., to handle the sales and distribution, in the metal finishing and allied fields, of the wide variety of complexing and chelating agents known as "Versenes," manufactured by the latter company. These newly-developed organic compounds, in both powder

HERE'S the ECONOMICAL "PACKAGE UNIT"

For HEATING and COOLING YOUR CORROSIVE SOLUTIONS . . .

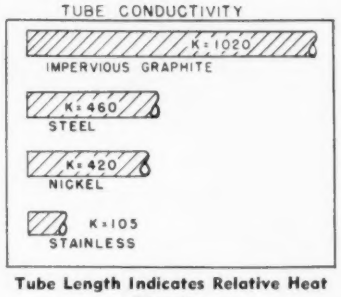


Typical #1251 Heil Exchanger installed with Nocordal* Impervious Graphite Tube.

CONSIDER THESE ADVANTAGES OF THE NEW #1251 EXCHANGER

WIDE SELECTION OF TUBE MATERIALS — Tubes are available in standard designs of Norcordal* Impervious Graphite, Nickel, Stainless Alloys and Carbon Steel.

LOWER INITIAL COST — Standard pre-engineered units to fit practically all conditions. Thus, more economical to you with faster delivery.



Tube Length Indicates Relative Heat Transfer
K = Btu/hr. × sq. ft. × °F. × in.

BOTH HEATING AND COOLING WITH THE SAME UNIT — This can be easily accomplished to save you additional space and investment.

GREATER FLEXIBILITY — Units contain either one tube or a bank of tubes and can be individually controlled to give you additional economy.

Products of Heil Process Equipment Corporation are sold by all leading electroplating jobbers.

THE HEIL #1251 EXCHANGER can be purchased with frame, pump and motor, temperature control, and any multiple combination of units. Submit your requirements to our engineering department.

*Trademark

HEIL PROCESS EQUIPMENT CORP.

12901 ELMWOOD AVENUE, CLEVELAND 11, OHIO

OTHER HEIL PRODUCTS INCLUDE: LINED PROCESS TANKS • IMMERSION HEATING UNITS • LINED PIPE AND DUCTS • ACID-PROOF MAINTENANCE MATERIALS • LEAD ANODES • PLASTIC FABRICATION

and solution form, are finding numerous applications, and their versatility insures many more potential uses to follow.

At present, their eployment in water softening, removal of impurities from plating solutions such as nickel, copper, zinc, silver, gold, etc., baths and for inactivation of troublesome metallic impurities in other process solutions are most noteworthy. Their use in cleaner formulations, detergents and in connection with wetting-agents and polyphosphates is also reaching significant proportions.

Besides handling the sale and distribution of these materials to the metal finishing and allied fields, the Electrochemical Industries, Inc. offers technical assistance in properly applying these compounds to the particular process in mind.

Engineering Firm Moves to New Quarters

Applied Engineering Associates, who were formerly located at E. 57th St., N.Y.C., have announced the moving of their offices and plant to *1952 Flushing Ave., Maspeth, Brooklyn 32, N. Y.* The firm specializes in the installation and engineering of equipment for vacuum metallizing of metals and plastics.

Fred Tholen Promoted by Wyandotte

Fred H. Tholen

Fred H. Tholen is now Sales Manager of the J. B. Ford Div. of *Wyandotte Chemicals Corp.* The appointment was announced by *Robert L. Reeves*, General Manager of the specialized cleaning materials division of the Wyandotte organization.

Mr. Tholen joined Wyandotte Chem-

icals in 1929, has served in the advertising, sales and package departments, managed the Seattle office, and for the past two years has been assistant sales manager.

In his new position, Mr. Tholen is responsible for the directing of more than 200 Wyandotte Sales and Service Supervisors who headquarter in 19 district offices and in 88 North American cities.

Rainey New Southern Div. Ass't. Manager for Diversey

W. G. Rainey

W. G. Rainey, manager of *The Diversey Corp.'s* Nashville sales district since 1944, has been named assistant manager of the Southern Div. by *W. E. Noyes*, vice-president in charge of sales. J. K. Bradford is division manager.

Diversey manufactures and sells cleaners used in preparing metal surfaces for finishing operations.

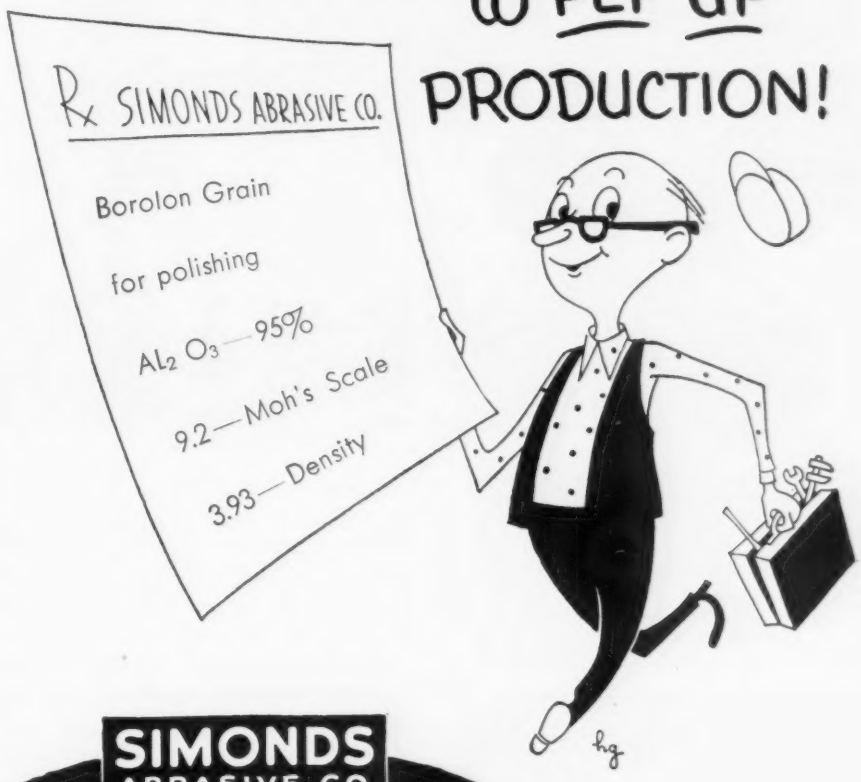
Rainey is a veteran of the selling field, having started his career in 1918. He has been with Diversey for nearly 15 years and is well known throughout the South.

Hooker Adds Engineering Personnel

Hooker Electrochemical Co., Niagara Falls, announces the following technical appointments:

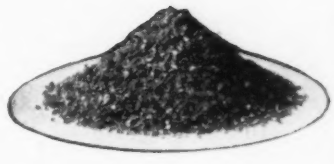
Wilma M. Vogt has been employed as a chemist in the Development and Research Department; *Orville R. Hicks* has joined the Engineering Department as a draftsman; and *Frank L. Echelberger* is employed as a chemist in the Works Laboratory.

Here's a prescription to PEP UP PRODUCTION!



SIMONDS ABRASIVE CO.

Abrasive Grain



Simonds Abrasive Company Borolon grain . . . hard, sharp, tough for top polishing performance. That's the meaning of this prescription . . . an effective one for detouring trouble during polishing operations. You'll find the right prescription for you in our free data book. It lists grain specifications for your jobs and gives details on Simonds complete line including grinding wheels, mounted wheels and points, segments. Let's send it to you together with the name of your nearby Simonds Abrasive distributor. Write.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

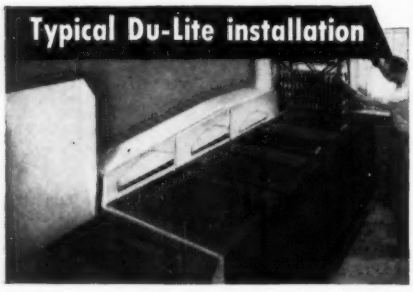
On any steel blackening problem

DEPEND on DU-LITE for a Superior Finish

Courtesy The Poly Choke Co.

Du-Lite gave this part with its complicated knurls, slots, threads, etc. a fine rust-resistant durable black finish. It is typical of many other parts, small and large, which have been black oxidized by Du-Lite for many years. Moreover, Du-Lite meets most individual and government specifications including 57-0-2C for Type III Black Oxide finish.

Typical Du-Lite installation



Du-Lite installations are simple, compact, easy to operate. Du-Lite equipment can be tailored to fit production requirements on all types of jobs with a maximum of speed and economy. Du-Lite also makes a complete line of cleaners, strippers, wetting agents, passivating agents, rust preventatives, burnishing compounds etc. for any metal finishing application.

See your nearest Du-Lite Field Engineer or write for more information.

DU-LITE CHEMICAL CORP.
MIDDLETOWN, CONN.

Rush information on your metal finishing products.

Name .....
Company .....
Address .....
City ..... Zone ..... State .....

Du-Lite
METAL FINISHING SPECIALISTS

Bob Huber New Pres. of Mich. Chrome

R. J. Huber

The board of directors of the *Michigan Chrome and Chemical Co.* has elected *Mr. Robert J. Huber* as president and general manager of the corporation. He succeeds his father, the late Mr. Phil Huber.

Mr. Huber is a graduate of the Sheffield Scientific School of Yale University and has been connected with Michigan Chrome and Chemical Co. since 1946. He had previously served three years as an officer in the Ordnance Department of the United States Army in World War II.

Mr. Huber has been vice-president and general manager of the corporation since 1950.

Mr. Russell Axsom was elected to the office of vice-president of the corporation. He has been associated with the corporation since the founding in 1929 and has previously served as the general manager of the Plating Division.

Mr. Arthur J. Fushman, senior vice-president of the Manufacturers National Bank, has been elected to the board of directors.

Purdue Conference Will Feature Plating Topics

The Seventh Annual Purdue Industrial Waste Conference, to be held at Lafayette, Indiana on May 7-8-9 will feature several papers of interest to platers.

One of these papers will be by *T. J. Fadgen*, whose topic will be "*Possible Use of Ion Exchange for Recovery of Metals from Plating Wastes.*" Another paper will be presented by *Reents* and *Armstrong* on "*Recovery of Nickel and Chromate Ions from Rinse Waters.*" *Paulson* and *Armstrong* will

for LONGER LIFE PLA-TANK® Resin-Bonded Fiberglas®

Many concerns are finding there's nothing like PLA-TANK for use with acids, plating solutions, emulsion cleaners, etc. Made of Fiberglas, impregnated, bonded with resins, molded into rigid, strong units — tanks, hoods and many other items last longer, cost less and will withstand lots of abuse. Equally resistant inside and out.

TANKS IN STOCK

These sturdy, economical tanks are available from stock in sizes from 12" x 12" x 12" to 72" x 36" x 36". Special sizes made to order. Special features such as holes, overflow dams, etc., can be built-in to order on all sizes. Try these tanks on your plating line. You'll be amazed at their long life.

Ventilating Hoods

PLA-TANK is also an excellent material for Fume Exhaust Systems. Hoods and duct work are welded into one sturdy unit, rigid and strong yet light in weight — at costs less than for usual corrosion resistant materials. Some sizes of hoods in stock — others on special order. Try them — you'll never use anything else.

Other Uses

PLA-TANK has dozens of other uses — pipes for conveying acids; linings for tanks or pits so large they must be welded in place on the job; plating barrels; crocks — these are but a few. Hundreds of satisfied customers can testify to the durability of PLA-TANK. Try it yourself in your own plant. Write us for tables of standard sizes, prices and chemical resistance reports.

THE Chemical CORPORATION
58 Waltham Ave., Springfield 9, Mass.

talk on "*Anodizing Solution Regenerated by Ion Exchange*," while *Hathaway* will present a paper on "*Vacuum Evaporation of Chromic Acid Rinse Waters*." *I. D. Cox* will talk on "*Combination Water and Plating Wastes Treatment Plant*." A report by *Walter Pinner* on "*Industry Action Committee for Metal Finishing Wastes*" will also be made.

These papers are in addition to a great many others covering all types of industrial waste treatments and problems. Registration is open to anyone interested. *Mr. Don E. Bloodgood*, at Purdue Univ., is handling all arrangements.

Corrosion Consultants Move

The A. V. Smith Engineering Co., Corrosion Consultants, announces its new location in the *Coulter Building, 121 Coulter Ave., Ardmore, Pa.* The offices are near the Ardmore Station on the Main Line of the Pennsylvania Railroad. Frequent bus and trolley service is also convenient to the new location.

Metals Disintegrating Co. Re-Elects H. E. Hall as President

The re-election of *H. E. Hall* as its president, is announced by *Metals Disintegrating Co., Inc.*, Elizabeth, N. J., manufacturers of metal pigments, metal powders and metal abrasives.

The officers elected at the annual meeting of the Board of Directors include: *H. E. Hall*, President and Treasurer; *Grover M. Hermann*, Chairman of the Board; *Julius F. Sachse*, Vice-President; *Mary Sohayda*, Secretary; *Joseph C. Newell*, Assistant Secretary; *Paul P. Weber*, Assistant Secretary;

H. E. Hall

Wheels CUT FASTER, LAST LONGER

When treated with Park KOLD-GRIP POLISHING WHEEL CEMENT

KOLD-GRIP Polishing Wheel Cement, laboratory-controlled through every step of production, will arrive at your plant *ready for use!* Viscosity is constant, regardless of normal temperature variations and the cement can be applied directly from the container . . . *without mixing or heating.* Kold-Grip is clean, odorless and very easy to handle.

Coarse or fine-grain abrasives set up right for fast cutting efficiency. Substantial savings are effected through longer over-all wheel life, fewer set-ups and reduced wheel inventory.

Wheels dry rapidly, are unaffected by humidity changes, and may be stored in any convenient plant area.

Let our polishing engineer demonstrate Kold-Grip for you, or send for free sample, telling us the metal to be polished, grain sizes to be used, and drying facilities available. We can help you if we hear from you.

• Liquid and Solid Carburizers • Cyanide, Neutral, and High Speed Steel Salts • Coke • Lead Pot Carbon • Charcoal • No Carb • Carbon Preventer • Quenching and Tempering Oils • Drawing Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement

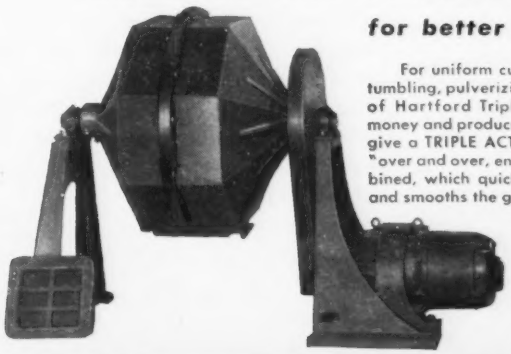
LICENSED MANUFACTURER: Electric Resistance Furnace Co., Ltd., Weybridge, Surrey, England

Park CHEMICAL COMPANY 8075 Military Detroit 4, Mich.

HARTFORD *TRIPLE ACTION*

CUTTING *and* TUMBLING BARRELS

for better work in less time!



For uniform cutting down, wet or dry grinding, tumbling, pulverizing and mixing, the unique design of Hartford Triple Action Barrels saves time and money and produces better results. Hartford Barrels give a TRIPLE ACTION in tumbling the material, an "over and over, end to end, folding-in" motion combined, which quickly grinds off burrs, and finishes and smooths the general surface of any article in the load. These barrels are available in two sizes, large and small, and with both motor and belt drive. Hartford also makes steel burnishing balls scientifically correct in design and material for each specific job. Bulletin on request.

THE HARTFORD STEEL BALL CO.

HARTFORD 6, CONN.

DETROIT	CHICAGO	NEWARK, N. J.	LOS ANGELES, CAL.	EXPORT
W. S. TURNER	VICTOR R. CLARK	GUARANTEE TRUST BLDG.	E. D. MALTBY CO.	R. A. RODRIGUEZ, INC.
445 NEW CENTER BLDG.	605 W. WASHINGTON BLVD.	972 BROAD ST.	1718 SOUTH FLOWER ST.	55 W. 42 ND ST., NEW YORK

2HS82

Make sure of trouble-free profitable Silver Plating

USE ONLY THE SILVER ANODES THAT BEAR THIS MARK

It's the mark you find only on Handy & Harman Silver Anodes . . . the mark that guarantees . . . (1) highest standards in fineness . . . (2) best physical properties for plating . . . (3) complete freedom from impurities that cause plating troubles . . . the reasons why you are sure of trouble-free, profitable plating when you use Handy & Harman 999 "Plus" Fine Silver Anodes. Try them next time you buy and see the difference.

HANDY & HARMAN

HANDY & HARMAN FOUNDED 1867 QUALITY · SERVICE

82 FULTON STREET · NEW YORK 38, N. Y.

Bridgeport, Conn. · Chicago, Ill. · Los Angeles, Cal.

Providence, R. I. · Toronto, Can.

James M. Coyle, Assistant Treasurer.

The directors elected at the annual meeting of stockholders, held the same date, include: H. E. Hall, Harry J. Hemingway, Grover M. Hermann, Edward F. March, Herbert J. Osborne, Theodore Pearson, and Robert E. Pflaumer.

Hampel and Modjeska Form Consulting Firm

The formation of *Hampel-Modjeska Laboratories* was announced in a joint personal statement by *Clifford A. Hampel*, formerly supervisor of extraction metallurgy at Armour Research Foundation, and *R. Scott Modjeska*, founder and director of Scientific Control Laboratories of Chicago, Illinois.

The new organization will conduct research and development studies, technological and economic evaluations, and consulting work for industry and government in the fields of industrial chemicals, electrochemical and electrometallurgical processes and products, and the recovery and utilization of strategic metals.

Until new quarters are available, the Hampel-Modjeska Laboratories will use the facilities of the Scientific Control Laboratories, 600 S. Blue Island Avenue, Chicago, Ill.

Van Clief to Manage Pittsburgh's Power Brush Plant

Appointment of *William C. Van Clief, Jr.*, as manager of *Pittsburgh Plate Glass Company's* new power

W. C. Van Clief, Jr.

driven brush factory at Baltimore has been announced by *E. D. Peck*, general manager of the firm's brush manufacturing division.

Mr. Van Clief has served as an industrial consultant since 1946 and prior to that was associated with the Wright Aeronautical Corp. A native of New York City, he is a graduate of the University of Florida with a degree of B.S. in Civil Engineering.

Cadmium Controls Eased

Relaxation of the use controls of M-19, the cadmium order, was announced recently by *Erwin Vogelsang*, Director of the Tin, Lead and Zinc Division of the National Production Authority, Department of Commerce.

The action has been taken to permit the civilian economy to share directly in the improved supply-requirements balance in cadmium.

The action is in harmony with NPA's announced policy of easing or eliminating production controls as soon as circumstances permit.

Specifically, the amended order permits:

1. Unrestricted use of cadmium in items or processes formerly included in the "permitted use" schedules of the order. In the case of cadmium-plated items, the list has been expanded to include electrical connectors for aircraft, anti-friction bearings for airframe controls, pulleys, rod-ends and universal joints, and electric and fluid de-icing equipment for aircraft propellers.

2. Unrestricted use of cadmium to fill orders bearing the rating symbols "A", "B", "C", "E" and "Z-2".

3. For all other items actually produced in the first half of 1950, a

monthly use of 70 per cent of the average monthly quantity of cadmium consumed for such purpose. Certain types of pigment have been removed from the permitted use schedule for cadmium-containing items, and these now fall within the 70 per cent use category.

Inventory controls of the former order have been retained.

Present indications are that substantial supplies of cadmium are now in the hands of producers, and these accumulations are expected to grow even larger in the coming months.

Military requirements have not developed as rapidly as anticipated.

Cadmium is an element obtained primarily as a by-product of the zinc industry by treating the flue dust and fumes from the roasting of ores. It has many metallurgical and chemical uses including electroplating or iron and steel, heavy duty bearings, in solders and alloys, and for the manufacture of yellow and red colors in the pigment industry. Cadmium bromide, chloride and iodide are used in photographic films, process engraving and lithographing.

Additional information may be obtained from Department of Commerce field offices.

Fitzgerald New Manager for Andrews-Knapp

The appointment of *John J. Fitzgerald* as manager, *Andrews-Knapp Construction Company, Inc.*, of Long Island City was announced today by *Alfred P. Knapp*, President of the company which specializes in the construction of lead-lined equipment for the chemical and process industries. For the past seven years, Mr. Fitzgerald has been general superintendent and vice-president of Keating Construction Company, Inc.

J. J. Fitzgerald

HEADQUARTERS FOR CHROMIC ACID

Increased production, pioneering research and intelligent technical service make the Mutual Chemical Company of America "Headquarters" for Chromic Acid in plating and metal finishing. Whether you are an old or new user of Chromic Acid, it will pay you to come to "Headquarters."

With the largest Chromium Chemical plant in the world located at Baltimore and a second plant in Jersey City, Mutual is your logical source of supply. So for Chromic Acid remember the name Mutual . . . first in production, research and service.

POTASSIUM BICHROMATE • SODIUM BICHROMATE

MUTUAL CHEMICAL COMPANY OF AMERICA

270 MADISON AVENUE • NEW YORK 16, N. Y.

Steinkamp Heads Minneapolis-Honeywell Industrial Sales

The appointment of *William H. Steinkamp* as sales manager of the industrial division of *Minneapolis-Honeywell Regulator Co.* was announced recently.

Mr. Steinkamp has been industrial field sales manager since 1943. He succeeds *L. Morton Morley*, who continues as vice president of the *Brown Instruments Div.* and who will assume greater responsibilities concerning division policies and other company matters arising from the accelerated demand for industrial instrumentation.

Royal-Walden to Make Chrome Tubular Furniture in N. Y. State

The Royal-Walden Corp., a new company, has purchased for an undisclosed consideration the two-building plant and facilities of Production Enterprises, manufacturers of toys and playground equipment, at Walden, N. Y., 50 miles north of New York City.

The plant will function as a division of *Royal Metal Manufacturing Co.*, and will produce the complete line of tubular steel furniture offered by Royal Metal, including tables and all types of seating equipment for offices, hotels, hospitals, schools, factories, restaurants, beauty shops and other commercial interiors.

The Royal-Walden Corp. will in

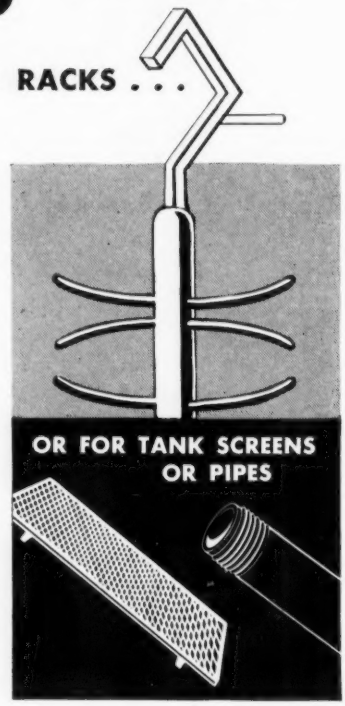
Extra ways to save with Coating 218X

NOTHING BETTER FOR RACKS . . .

Users of Coating 218X know this green plastisol can't be beaten for rack protection They've seen it stand up in all plating and anodizing baths, the toughest cleaners, even vapor degreasing cycles. Bumps, abuse, abrasion – all taken without damage by this flexible, shock absorbing, thick coating. In short, it gives them more rack protection, with less maintenance, and therefore the least cost.

As on racks, a single application of Coating 218X will give outstanding protection and eliminate need for frequent maintenance on:

- dipping baskets
- drain boards
- conveyor hooks
- tote boxes
- anode hooks
- tank linings
- plating barrels
- flexible cable
- hand tools
- heat exchangers



Coating 218X will work for you in more ways than one—to save money, equipment, time. Ask us about it.

UNICHROME Trade Mark COATINGS for METALS

Metallic . . . . . Organic . . . . . Decorative . . . . . Protective

Products of UNITED CHROMIUM, INCORPORATED

100 East 42nd St., New York 17, N.Y. • Detroit 20, Mich. • Waterbury 20, Conn. • Chicago 4, Ill.
Los Angeles 13, Calif. • In Canada: United Chromium Limited, Toronto, Ont.

effect serve as an eastern outlet for Royal Metal products, and will supplement the present Royal Metal factories in Michigan City, Ind.; Warren, Pa.; Los Angeles, Calif.; and Preston and Galt, Ont. Headquarters of Royal Metal are at 175 N. Michigan Ave., Chicago, Ill.

The Royal-Walden Corp. will commence operations about May 1st, following the installation of modern metal fabricating and finishing equipment. Floor area of the Walden plant now totals in excess of 30,000 square feet, with acreage for future expansion. The total labor force eventually will exceed 100.

Gaylord Webster has been appointed general manager and assistant secretary-treasurer of the new firm. A long-time Royal Metal employee, he has been production manager at the Michigan City factory.

Jack Grieser Joins Metal Spray Organization—Firm Marks 18th Anniversary

Jack B. Grieser, of Milwaukee, has joined the sales staff of the *Metal Spray Corp.*, it was announced recently by *P. G. Dennison*, president of the firm which is celebrating its 18th year in business this year with the addition of 15,000 square feet to their shop facilities.

Mr. Grieser, who has been affiliated with industrial accounts since 1938, has a sales background in metallizing equipment as well as metallizing shop experience. The Metal Spray Corp., founded in 1934 by Mr. Dennison, has developed and perfected techniques for building up worn dimensions and applying corrosion-resistant finishes for all metal products and equipment.

New Lead-Burning Plant Opened in Los Angeles

The California plating industry can now boast the addition of a much-needed lead-burning plant. The *United Lead Construction Corp.* opened their fully equipped plant in East Los Angeles under the presidency of *John E. Whitney*. It has the backing of a prominent Eastern corporation.

The new firm is equipped to design and build steel tanks. Through years of experience their personnel have developed a method of bonderizing lead to steel or any other material in a fashion most suited to the proposed operation. The application of lead can be performed either in their own plant or on location. The fact that the complete construction can be handled by one concern saves the customer much time and expense.

Another specialty of the firm is their ability to design acid-resisting lead coils for the purpose of either refrigeration, steam heating, or water cooling. Again, experience has helped in developing an ingenious method of constructing a coil that will not sag, wobble, or change it's shape.

United Lead carries a stock of lead anodes, with an alloy of either antimony or tin, that can be cut to specifications upon request.

Detrex V.P. Says Greater Supplies of Trichlorethylene are Available

Greatly increased supplies of trichlorethylene metal degreasing solvents are now available to industry, according to *A. O. Thalacker*, Vice-President and General Manager of *Detrex Corp.*, Detroit 32, Michigan.

The increased availablity of premium quality trichlorethylene, manufactured by Detrex under the trade name Perm-A-Clor, has been made possible by the company's expanded manufacturing facilities. This highly stabilized solvent is now priced competitively with ordinary grades of degreasing solvent, thus giving a premium product without premium prices, according to Mr. Thalacker.

New Wisconsin Polishing Firm

Industrial Polishing & Mfg. Corp.

has been formed recently in Milwaukee, with an authorized capital stock of 1,000 shares of common of no par value. Incorporators are *Edward J. Riesch, Clara B. Zenoff* and *Henrietta L. Miller.*

Barrel Finishing Distributing Company Change Address

The Eldon Co., distributors of barrel finisihng equipment and supplies who were formerly located on 79th St., Milwaukee, have moved recently to new quarters at *3176 N. 81st Street, Milwaukee 16, Wisc.* The firm also maintains a Chicago office at 55 E. Washington St., Chicago 2, Ill.

Copper Supply for Second Quarter 1952

Second quarter CMP copper orders probably can be filled by careful distribution of available supplies, according to *Paul B. Andrews*, Acting Director of the Copper Division of the National Production Authority, Department of Commerce.

Mr. Andrews explained that this is due to increased flow of copper and brass scrap, which has resulted in a slight easing of the supply during the past few months.

Several factors have contributed to the increased availability of scrap to producers of copper controlled materials such as brass mills, ingot makers and foundries. These factors include:

A steady increase in scrap offerings since November, 1951, reflecting partly the softness of foreign markets, and in anticipation of a similar easing of the domestic market.

Success of the Department of Defense in collecting and returning scrap resulting from the fabrication of ammunition and other military products.

Return of an increasing amount of old scrap by the military services for allocation by NPA.

The success of other salvage programs.

Pricing policies of the Office of Price Stabilization.

Effective at once the Copper Division will attempt to bring into balance inventory positions of the brass mill, wire mill and foundry industries.

April allocations of refined copper to brass mills have been increased, and wire mill allocations have been reduced. There have been some adjustments for foundries and ingot makers. This is because of the imbalance of inventories that has developed after seven months operation of M-16. After further analysis of the needs of individual mills and foundries for working inventories of copper raw materials, however, it is expected that realistic inventory criteria can be established for individual companies as well as for the major copper consuming industries as a whole.

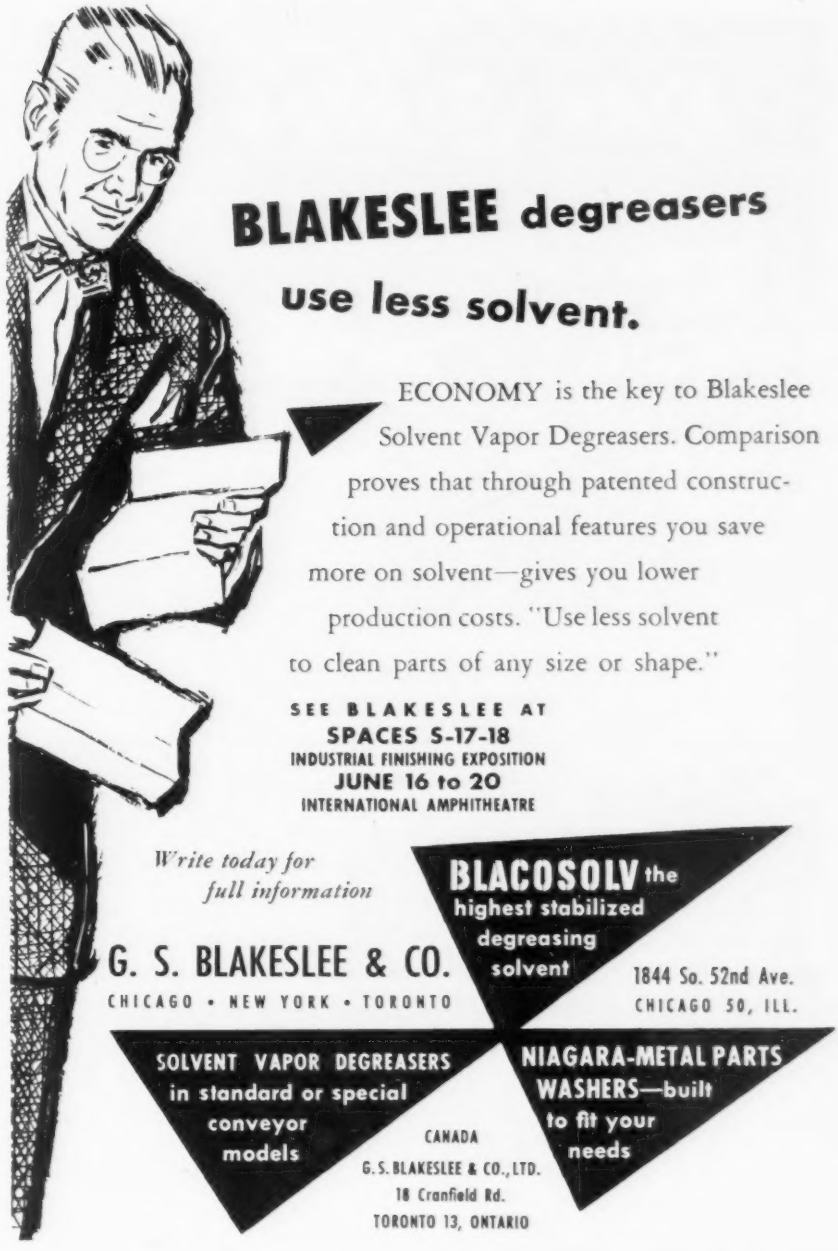
Meanwhile the Copper Division of NPA, in collaboration with other interested Government agencies, will continue its program of increasing scrap supplies by preventing the accumulation of unused scrap at all levels. It also will attempt to bring about increased supplies of scrap to be made available to custom smelters and refiners in order to increase the production of refined copper.

Among the means to be employed will be restriction of scrap allocations under NPA Order M-16 to consumers such as ingot makers and foundries, and the application of compliance measures to violators of M-16 for acceptance of un-authorized grades or amounts of scrap.

Inventories are dangerously low at mill levels. This situation calls for careful balancing of raw material supplies. As supplies increase inventory limitations will be raised to more normal levels.

Cadmium in January

Production of primary and secondary metallic cadmium in January was 7% above the December output, according to the Bureau of Mines, United States Department of the Interior. Total production for the month was 779,735 pounds compared with 726,-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195 pounds in December. The average monthly production in 1951 was 685,725 pounds; 1950 was 749,664 pounds.

Stocks of metal maintained by metal producers declined for the first time since August 1951; inventories totaled 834,928 pounds on January 31 compared with ending stocks of 939,952 pounds in December. Compound producers' stocks of metal continued to increase, however, from 225,512 pounds on December 31 to 242,420 pounds at the end of January.

There were no imports of cadmium metal or flue dust in January. Imports of metal have been negligible since April 1951, but imports of cadmium contained in flue dust averaged 128,814 pounds per month in 1951. Exports of metal and flue dust declined to 27,420 pounds during January compared with 127,188 lbs. in December.

Manufacturers' Literature

Lead-Clad Copper & Steel

Knapp Mills, Inc., Dept. MF, 23-15 Borden Ave., Long Island City, N. Y.

The new lead-clad metals are becoming so important in so many industries and are solving so many design and process problems that it is essential for engineers, designers, and technicians to understand their characteristics.

For this reason the above firm has published a new 22-page booklet "*The History and Development of Ferrolum Lead Clad Steel and Cupralum Lead Clad Copper.*" Readers may obtain copies by writing to the above address.

Backstand Belt Polishing

Armour and Co., Dept. MF, North Benton Rd., Alliance, O.

A free booklet, just published by the above company offers a clear, concise explanation of the purposes, uses and advantages of the backstand polishing method of metal finishing.

Attractively illustrated, this booklet is excellent for shop manager and foremen. It could also be used to demonstrate to trainees the advantages of backstand belts.

This booklet, complete with case-histories of companies which have made significant savings by switching to backstand belts, is available free.

Plating Barrels

Belke Manufacturing Co., Dept. MF, 947 N. Cicero Ave., Chicago 51, Ill.

Describes plating barrels of all types and sizes with auxiliary equipment and accessories; also modern layout for low cost plating production.

Buffing & Polishing Compositions

The Buckeye Products Co., Dept. MF, 7020 Vine St., Cincinnati 16, O.

Publication of the Third Edition of its booklet on "*Speedie Buffing and Polishing Compositions*" has just been announced by the above firm. Fully revised with the latest developments in the line of both dry and liquid Speedie Compositions, and chock full of information which will prove of interest and value to every buffing and polishing shop, the booklet is available.

Selenium Rectifier Stacks

General Electric Co., Lighting & Rectifier Div., Dept. MF, Schenectady 5, N. Y.

A new 28-page, two-color booklet describing the basic characteristics and the applications of selenium rectifier stacks has been announced by the above company.

Designated as GET-2350, the booklet is complete with charts, graphs, and tables illustrating the principles of rectification, and the characteristics, manufacture, circuit design, and application of selenium rectifiers.

Washing Metals in Machines

Oakite Products, Inc., Dept. MF, 154 Rector St., N. Y. 6, N. Y.

The above firm, manufacturers of

industrial cleaning and allied materials, have announced the publication of a 16-page illustrated booklet, "*8 Things to Look for When You Wash Metal by Machine.*"

The booklet reviews specialized materials available for use in metal-washing equipment and tells in detail the jobs they do. In connection with the selection of detergents for use in metal-washing machines, the booklet provides helpful data on the following factors to be considered: (1) Is the cleaning material specially designed for your type of work? (2) Will the cleaning material help your machine operate more efficiently? (3) Does the "service" behind the detergent help you in obtaining good results? (4) What jobs are done best by solvent detergents? (5) What jobs are done best by alkaline cleaning materials? (6) How to prepare metal for painting; (7) Tips on selection and operation of washing machines; and (8) special aids to better operation. Under the latter heading, the booklet describes helpful equipment available to promote efficient operation of metal-washing machines by simplifying determination of correct solution strength, operating temperature and upkeep, so that waste of cleaning materials is avoided.

Readers desiring copies of this booklet may obtain them, without charge, by writing on company letterhead.

Guide to Pressure Cleaning Operations

Wyandotte Chemicals Corp., Dept. MF, Wyandotte, Mich.

A circular, "*Wyandotte Products for Pressure Equipment Maintenance Cleaning*" is available by writing to the above address.

Ask for C-677. The circular contains a guide and directions for use of specially compounded alkaline powders and emulsions for pressure cleaning operations.

Cleaners for Effective Metal Cleaning

The Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

The above firm offers a newly revised bulletin entitled "*Cleaners for Effective Metal Cleaning.*" The bulletin will be of interest to all those concerned with cleaning metal prior to electroplating, anodizing, painting or otherwise applying decorative or protective coatings.

The brochure first defines six different methods of metal-cleaning. Next, a table lists which cleaners to use for aluminum, brass, bronze, copper, lead-alloys, magnesium, steel, iron, and zinc-base die castings. Following are sections devoted to soak cleaners and electrocleaners. The section on soak cleaners lists seven types of cleaners and gives the applications, recommended concentration, and temperature range of each type.

The section on electrocleaners lists 15 cleaners and gives the application, recommended concentration, current density, and temperature range for each type.

Concluding the bulletin are sections on spray washing machine cleaners and specific purpose cleaners. The spray washing machine section lists three cleaners and gives their applications. The section on specific purpose cleaners includes four acidic types, two solvents and two aluminum etchants. As before, application data is given for each type cleaner. For copies of "Cleaners for Effective Metal Cleaning"—Bulletin C-107—write to the above address.

Plant Maintenance Coatings

United Laboratories, Inc., Dept. MF, 16801 Euclid Ave., Cleveland 12, O.

A completely new 4-page bulletin describing a dozen different special coatings for plant maintenance use has

Question!
How to Solve Your Thickness Problems?
Answer!
With the New KOCOUR Electronic Thickness Tester!
DETERMINES THE THICKNESS OF METALLIC COATINGS BETTER! . . . FASTER! . . . EASIER! . . . CHEAPER!
The new KOCOUR ELECTRONIC THICKNESS TESTER is the answer to your thickness problems . . . QUICKLY and almost AUTOMATICALLY . . . this highly accurate instrument can determine the thickness of all the commonly plated metals on various base metals . . . thus putting an end to costly rejects and reworking.
KOCOUR'S NEW ELECTRONIC THICKNESS TESTER HAS THESE OUTSTANDING FEATURES:
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Pioneers and Specialists in Testing Equipment Since 1924.
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been issued by this firm. This new literature describes the use of various industrial products for solving such problems as skidproofing, rust prevention, painting over damp areas, weatherproofing and decoration of exterior masonry, interior waterproofing, painting over hot surfaces, protection against acids, chemical fumes and other special maintenance work. The numerous problems are listed in the folder followed by brief suggestions as to the solution. This bulletin is available without charge upon request.

Blasting Shot and Grit

The Cleveland Metal Abrasive Co., Dept. MF, 887 East 67th St., Cleveland, O.

"*20th Century — The Persuasive Abrasive*" is the title of a new 8-page catalog just published by the above company. The title is indicative of the products featured in the catalog; the company's line of quality abrasive materials, including shot, grit and iron powder.

The types of abrasives produced by this firm chilled iron shot and grit, normalized shot and grit, drawn-steel cleaning and peening shot, and iron powder. All shot and grit is made in a number of different sizes and special sizes are available on order.

The uses, advantages and the proper selection of 20th Century abrasives are fully explained in this new illustrated Catalog No. 152.

Closely supervised production, continuous research and improvement have resulted in products which are now being utilized in thousands of foundries and metal working plants in the United States and Canada.

Barrel Finishing Compounds

Blue Magic Chemical Specialties Co., Dept. MF, 2135 Margaret St., Philadelphia 24, Pa.

A new catalog on barrel finishing compounds lists various Blue Magic products and their characteristics, applications and advantages. Special purpose compounds in concentrated paste and powder forms are described for deburring, cleaning, polishing, burnishing and lusterizing non-ferrous and ferrous metal castings, stampings and other parts or products that can be barrel tumbled. Gives case histories of time savings. The firm offers laboratory facilities for trial runs and working samples for test.

Controlled Volume Pumping

Lapp Insulator Co., Dept. MF, Proc. Equip Div., LeRoy, N. Y.

A new 24-page two-color bulletin describes this company's line of Pulsafeeder piston-diaphragm pumps.

The feature of *no stuffing box* is stressed throughout the bulletin, and it is noted that Pulsafeeder, although basically a pump, will do the work of a chemical feeder, a meter, an instrument, a filling machine, a proportioner and a sampler.

An imposing list of chemicals handled by the Pulsafeeder emphasizes its versatility on hard-to-handle chemicals.

The bulletin also goes into considerable detail on special liquid-handling assemblies which cover a completely non-metallic construction of Lapp Chemical Porcelain and fluoro-plastics, a double diaphragm head for liquid chlorine and other hazardous liquids, a completely isolated pumping head, a head for gas compression and an all welded assembly without gaskets.

Both manual and automatically-controlled types are described. In manual control, adjustment of outut is changed by turning a handwheel, while in the automatic design the adjustment is made pneumatically.

Several pages describe the Auto-Pneumatic Pulsafeeder, pointing out its adaptability to automatic volume adjustment from commercial pneumatic instruments. Instruments measuring such process variables as flow,

pH, weight, pressure, temperature and others can be used as control for the Auto-Pneumatic Pulsafeeder.

The bulletin also describes Lapp Pulsafeeder for chemical water treatment, catalogued Model DE, and Model 200 Pulsafeeder transfer pumps, the latter being high volume pumps operating on the Pulsafeeder piston-diaphragm principle.

The Bulletin is identified as No. 300, and will be sent on request.

Temperature Controls

Burling Instrument Co., Dept. MF, South Orange, N. J.

The above company announces the publication of a new 12-page illustrated catalog, No. G-17, which describes their full line of temperature controls.

Special features of this catalog are the additions of four new instruments and inclusion of tables of application and performance for all instruments.

The new additions include the Model V-1C—an electric type with a vapor tight cover; the model HA—for use in pneumatic systems; and the various models Y—temperature controlled valves.

Covered also is the use of Burling controls for temperatures from minus 300 to plus 1,800°F. and in various severe applications.

A copy of catalog G-17 will be mailed on request.

Water Conditioning Data Book

The Permutit Co., Dept. MF, 330 West 42nd St., New York 36, N. Y.

A greatly enlarged edition of the popular Permutit Data Book has been prepared by the above company, New York, N. Y. This practical data book supersedes an earlier volume produced in 1949. Brought up-to-date and completely revised, it presents a compilation of 77 tables, all valuable to the engineer.

The subjects covered, to name a few are: Hydraulics, Impurities in Water, Chemical Conversions, Saturated Steam, Boiler Feedwater Makeup Requirements, Chemicals Used in Water Treatment, Alkalinity Relationships, Specific Gravities, and Chemical Reactions.

This handsome, leatherette bound volume in the very handy 5 by 7¼ inch size contains 116 information-packed pages. It is available to practicing engineers and those who work with water conditioning problems.

Save Time! Cut Costs!
With SPEEDIE STEEL COMPOSITIONS!

Whether you're buffing cold roll, carbon or stainless steel, you'll find a SPEEDIE Composition that will do a real job for you . . . one that will cut down on a Sisal, then buff and color with a cotton buff!

Here's a sure bet if you're buffing copper. No. L-86D SPEEDIE Bright Gloss buffs and colors copper to perfection. You'll be delighted with the results. Easy to clean.

If you're interested in cutting costs, write today for information on the right SPEEDIE Buffing Composition. Give us details as to your buffing problem and we'll give you the compound to do the job, cutting down on the old overhead.

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Cable address: Buckprod

CLEAR LACQUERS

(*Concluded from page 59*)

tinuity of coating. That might be done by means of the ultra-violet lamp, fitted with a Wood's dark glass filter. Under that test some finishes would fluoresce or glow, so that defects in the film could be readily detected. All lacquers responded to that test if a trace of fluorescent indicator was added before application.

In the discussion which followed the presentation of the foregoing papers it was brought out that American practice seemed to favor no rinsing after the chromic acid dip, the retained heat from the parts being sufficient to dry the work with the slight chromic acid film left on.

It was also generally agreed that a baked-on lacquer was best for chromium plate, with epoxy resin compositions being one type that provided excellent resistance to abrasion and good outdoor durability. One difficulty with epoxy resin-based materials was the difficulty in stripping them from defective work. Even boiling for 30 hours in caustic only caused .005" film to turn yellow, whereas most other types of material, including alkyds, could be fairly readily stripped.

No. 800 AIR DRY PASTE RACK INSULATION

Now available! Air Drying Paste for insulating Plating and Anodizing racks. As little as three air dried coats provides a thick, resistant, flexible insulation that really stands up. Requires no oven baking or prime coats. Brush or dip. Labor cost reduced. Time saved. Small investment. BUNATOL No. 800 Air Dry is a soft paste liquid that flows on easy and is not stringy; and has little run off. Makes an excellent protective coating for outside of tanks, piping, ducts and hoods. A single application can be made as thick as wanted. Fine for patching any kind of rack insulation. Write for detailed information or order a trial gallon.

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BUNATOL

News from California

By Fred A. Herr

Superior Plating Co., Compton, Cal., has expanded its facilities for chrome plating by the recent installation of a new 820 gallon solution tank, bringing its chrome capacity to 3,200 gallons. Additional generator facilities were also installed. The firm does considerable volume of finishing work on aircraft parts and oil field tools, including drill stems, plunger rods and other drill table appurtences. Owner *Dewey Deovlet* also serves as supervisor of plating.

E. G. "Dick" Richardson reports that he has sold his interest in the *Progressive Plating Works*, Long Beach, to his partner, *Stanley Mashburn*, who is now sole owner. Dick and Stanley had been joint operators for some seven years of the shop which specializes in the manufacture and finishing of lighting fixtures. Richardson, who is a vice-president of Los Angeles Branch of the American-Electroplaters Society, now serves as supervisor of finishing operations for the *Atlas Plating Co.* of Los Angeles, cadmium and zinc specialists.

Dexter Halldin, of the Jig & Tool Plating Co., Los Angeles, appeared at the Los Angeles Branch's annual educational session encased in a plaster cast from shoulders to hips. When he left for home, the entire front of the cast was covered with autographs of A.E.S. members. Dexter had some time ago sustained a fracture of the lower spine as the aftermath of a friendly (?) wrestling joust with his brother, and spent six weeks in the hospital.

Paul Soderly, formerly with *Plating Engineering Co.*, Glendale, has established himself in business in Burbank under the firm name of *A-N Plating Co.* The new shop is equipped with anodizing, zinc and cadmium facilities which are devoted to plating airplane parts.

The plating shop operators of the San Fernando Valley area of Los Angeles, in which *Andrew "Carload Andy" Ospring* was a familiar figure for a half dozen years while he covered the territory for the *Sundmark Supply Co.*, do not see the affable Andy so much any more. Andy has retired from the traveling sales end of the plating business and is engaged as a process engineer with the *Precision Engineering Co.* in Glendale. Andy wears with great pride a signet ring which was presented to him by the officers and staff of the Sundmark Supply Co. on the occasion of his retirement from that firm.

The William A. Vensel Co. has opened sales offices at 1423 South Broadway, Los Angeles. Organized in 1950 by *William A. Vensel* (formerly owner of the Southworth Co.), the Vensel Co. operates a 5,000 square foot factory in Puente, Calif., for the manufacture of product finishing systems, convection ovens, degreasers, paint spray booths, washers, conveyors and flow coating machinese. Mr. Vensel designed, developed and pioneered the manufacture on the West Coast of paint flow-coating machines.

Manville D. Smith, managing director of *Industrial Son-Radio, S. A.*, Lima, Peru, was in Los Angeles on a two-weeks business trip in March during which he made arrangements for the purchase of equipment for a new

record stamping and plating department in his Lima shop. Mr. Smith acquired Coast Export Co. equipment for a 10-position stamping and plating installation, along with solution tanks, two punch presses, a polishing lathe and rectifier facilities.

J. G. Washington has been appointed sales manager for *Inet, Inc.*, Los Angeles, manufacturers of direct current supplies and controls, and rectifiers. He formerly was manager for the Line Material Co. at Albany, N. Y.

Russ C. Hedeen, head of the *R. C. H. Supply Co.*, Huntington Park, has announced appointment of his firm as southwestern area distributors for Mall Tool Company's (Chicago) line of flexible shaft buffers, grinders, sanders and centering wheels for the finishing industry.

Horace Smith, newly elected secretary of San Francisco Branch, American Electro-Platers' Society, attended the 1952 annual educational session of Los Angeles Branch in March. He was accompanied by *F. W. Huntington*, of San Francisco.

American Minerals Co. has moved into a new plant housing offices and distributing plant at 3600 Garfield Avenue, South Gate. The firm serves the Los Angeles industrial area with petroleum solvents and thinners, mainly at the tank-car level.

Russell Burbridge recently was appointed works manager for the *Ajax Hardware Manufacturing Co.*, Los Angeles. The firm operates one of the most completely equipped finishing departments in Southern California for finishing door pulls, handles and catches and a wide line of cabinet hardware. Its chief machinery features include automatic plating setup for copper, nickel and chrome, plus an adjacent hand plating line, and a new full automatic buffing machine. *Harry Rubin* is finishing room foreman.

Clifford Fears, a partner in the *Palace Plating Co.*, Los Angeles, is reported to be recovering satisfactorily from an ulcer operation which kept him away from his shop duties for more than a month in March and April.

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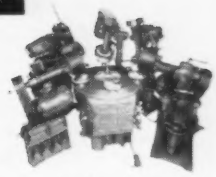

Model K-46-6 Super 5 Head Rotary Automatic. (One of a line of Rotary, Strait-Line, and Jr. Automatics).
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There is no substitute for EXPERIENCE

With the new and better constantly coming into the picture and the old going out, these 70 years have not been long.

Even so, they have piled up a big bank of experience to which we add and draw from each day.

We are grateful for the confidence of tens of thousands of HAMMOND users. For them and for all, through ever broadening research, engineering, and production, we propose to insure another 70 active and eventful years.

Model VRO "DIAL CONTROLLED" Variable Speed Polishing Lathe with Model 3-A (air-tensioned) Backstands.
WRITE FOR CATALOG A-60

MODEL RRO Single Speed—Two Spindle — Two Motor Polishing and Buffing Lathe. Each spindle can be driven at speeds from 1800 to 3600 RPM.
WRITE FOR CATALOG A-60

Hammond Machinery Builders INC.
1601 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN

Ralph J. Price has been promoted from metallurgical supervisor to chief metallurgist for the Bethlehem Steel Company's Los Angeles plant.

Richard A. Snyder has been named district sales manager of the Industrial Cleaners Div. of the *Pennsylvania Salt Mfg. Co.* of Washington, with headquarters in the Westland Warehouse Building, Los Angeles. He was formerly active as a sales engineer for the company.

Clarence Thornton, of Los Angeles, who went through a long seige of illness during the past six months, has resumed his duties as west coast manager for the *Chas. F. L'Hommedieu & Sons Co.*, of Chicago.

Harold Heisinger, 44, vice-president of the Plating Engineering Company, Glendale, Calif., and *John Hokom*, 45, vice-president of the Hokom Plumbing Co., Los Angeles, are believed to have drowned during a recent fishing expedition on Lake Mead, Nev., when a storm whipped up the lake. They were last seen about five miles from a spot where their empty motorboat, filled with water, was found. A four day search of the lake failed to uncover a trace of the two men.

Dexter Halldin, of the Tool & Jig Plating Co., Los Angeles, a member of Los Angeles A.E.S. Branch, was reported in mid-March confined to Garfield Hospital, Monterey Park.

The Missing Addition to your plating puzzle

To obtain a bright, dense, heavy, and smooth deposit of copper in a minimum amount of time and at a minimum of cost, we suggest an "addition!"
W.C.M. Brite Copper
Mirror bright
Readily buffed
Flows better
.001 to .0015 in approx. 30 minutes
20 to 60 amps. per sq. ft.
Adaptable to Periodic Reversal
May bag anodes without polarization

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Armalite Co., Ltd. Toronto, Canada
General Supply Co. 5317 St. Clair Ave. Cleveland, Ohio
Industrial Chemical & Equip. Co. 205 11th Ave. South Minneapolis, Minn.
MacDermid Sales & Equip. Corp. Bristol, Conn.

Calif., for treatment for a spinal injury.

Metallon Corporation, 1851 Randolph Street, Huntington Park, Calif., which heretofore specialized in manufacturing and finishing plumbing parts, has started production of 6-gallon carbonated dispensers. The units are made of stainless steel with no plating operations, only polishing, involved in their manufacture.

In commemoration of its 40 years of successful business operation in Southern California, *U. S. Spring & Bumper Co.*, of Los Angeles was featured on the Richfield Oil Company's "Success Story" program on TV Station KTTV recently.

In addition to interviews with company executives, the program featured talks with departmental foremen and views of production operations in the firm's heat-treating, inspection, assembly, plating and polishing departments.

R. J. Raffery, of the Los Angeles staff of *Handy & Harman* has been transferred to Oakland, Calif., to serve as resident representative for the San Francisco Bay area.

Price-Pfister Brass Manufacturing Co., Los Angeles, has completed installation of additional equipment for production of ordnance components.

Special Grinding Co., Culver City, has construction underway on a new shop for tool and cutter grinding and finishing at 11910 West Jefferson Blvd.

Aluminum Body Corp. has acquired three acres of land in Montebello, Calif., as the site for a larger plant for production of aluminum trailer bodies and sleeper cabs. Completion is looked for early in 1953.

LETTER TO THE EDITOR

Mr. Walter Raymond, Editor
METAL FINISHING
381 Broadway
Westwood, N. J.

Dear Walter,

I've just gotten around to a thorough persual of your February issue and in the Shop Problem Section find something dangerous.

There is a query from C. R. M. asking about the relative merits of $CaSO_4$ and $Ca(OH)_2$ for removing carbonates. In the answer the statement is made that the Na_2SO_4 resulting from using $CaSO_4$ is harmless to the solution. This is undoubtedly true from a plating viewpoint, but suppose this questioner happens to be using steel anode baskets? I once got into very serious trouble by using this method without considering the effect of the sulfate on the steel baskets. Believe me it was heartbreaking to have to replace them all. I would strongly recommend that only $Ca(OH)_2$ be used.

Sincerely,

LARRY DURNEY
Sargent & Co.
New Haven, Conn.

NEW BOOKS

Selling to Industry

By Bernard Lester. 255 pages, 4½ by 6⅞ inches. The Industrial Press, 148 Lafayette St., New York 13, N. Y. Price, $3.50.

This is a compact, pocket-size book that has been written as a manual of practical ideas and suggestions for the sales engineer who wants to analyze and improve his methods of finding, contacting, selling and servicing industrial customers.

As the author points out in his in-

troduction, "Selling any prospect effectively does not follow a beaten path. Prospects and salesmen vary in temperament, habits and interests. Products sold differ, and new problems in their application and use continually crop up. But success in selling is not a haphazard affair. Proper preparation and orderly enthusiastic procedure are necessary." In this manual Mr. Lester has set forth in a brief and realistic way those key points which have, from experience, been found to be most effective. He writes from a wealth of experience as sales executive for Westinghouse Electric Corporation, lecturer on sales engineering and marketing at the University of Pittsburgh, Stevens Institute and Brooklyn Polytechnic Institute and as a consultant on machinery and equipment marketing and selling.

The book is written in the form of short easy-to-read articles which are grouped in a series of sections entitled: "Prospects are Our Market; Just How do Prospects Buy; Sales Program Essentials; Make the Sales Program Effective; Successful Sales Interviews; Sell the Prospect's Employees; Be a Better Equipment Salesman; Getting Help from Others; Use All Our Sales Tools; Meet the Prospect's Objections; Follow Up the Customer's Decision; Grow in Power and Sales Skill; and When Orders Hang on Trees." Most of these articles have appeared in *Machinery* in somewhat briefer form and reprints of many were used effectively by several industrial concerns in the metal-working field.

At a time when industrial equipment and machinery are in heavy demand with large backlogs of orders building up in many cases, it would seem that the need for sales guidance and training was not very great. Mr. Lester, however, presents sound and convincing reasons for continued, planned sales and service effort regardless of the present-day market prospects.

This book seems well suited for adoption by industrial concerns as a training manual for their sales engineers.

Exhaust Hoods

By I. M. Dalla Valle. Pub. by Industrial Press, 148 Lafayette St., N. Y. 13, N. Y. Price $3.50. 141 pps.

This book is based on the author's own experiemental investigations into the flow of air around and into the openings in exhaust ventilating systems. Backed by over twenty years' experience in the field of industrial hygiene, it is a concise assembly of both fundamental theory and of practical applications of theory to the actual design of hoods for all typese of industrial installations. Originally published as a series of reports of the author's extensive research into the subject, the basic material has been considerably expanded, and has been coordinated with data by other investigators covering all phases of hood, booth, and slot design.

Increased emphasis on industrial health hazards in plants where harmful and dangerous dusts, vapors, gases or fumes are generated has resulted in a demand for accurate design of exhaust systems, of which the hood is a most critical part. In Exhaust Hoods, four chapters are devoted to the various aspects of theory, including flow of gases, velocity characteristics of canopy hoods, and criteria for determining hood effectiveness. Five chapters cover actual hood design for various types of applications. Other chapters cover booth-like structures, grille openings, woodworking machinery, examples of hood design calculations, entrance losses, and the essentials of good construction. Sample problems, with the solutions worked out in detail, are given in a chapter devoted entirely to this matter. Mr. Dalla Valle is professor of Chemical Engineering, Georgia Institute of Technology.

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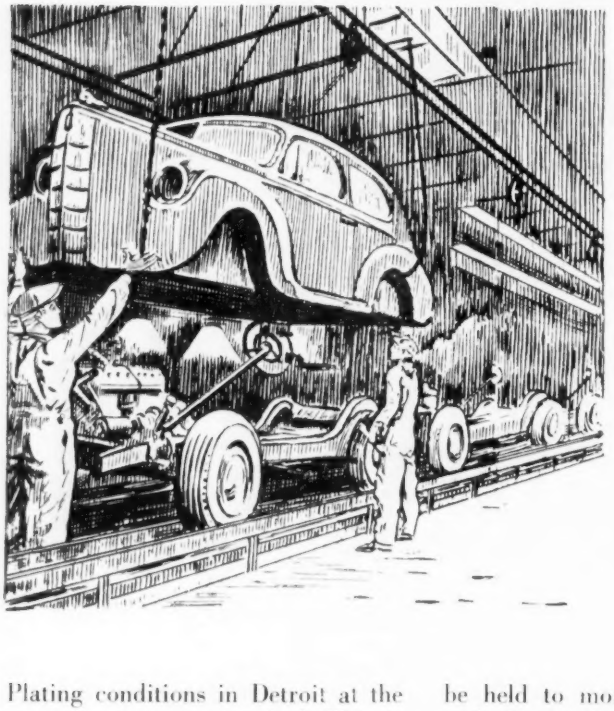

MOTOR CITY PLATING NEWS

by

Edward Finne

Plating conditions in Detroit at the present time are not too bad. This is particularily true in the rustproofing field, where defense work is increasing. As is the case in wartime plating, the jobs get tougher—thicknesses are more closely maintained, quality must be held to more rigid specifications, and the inside anode must be used much more often. We know of no particular hardship in the cadmium and zinc plating phase of the industry. However, the bright plating situation is not in the best of shape. Scarce nickel is still hurting the bright platers, but the use of white brass as an undercoat for chrome is relieving this condition somewhat.

Generally, the plating business conditions in Detroit are not causing too much suffering. We think that the in-

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crease in defense work is helping the situation considerably.

****

The March meeting of the Detroit Branch of the A.E.S. was held on March 14th at the Statler Hotel.

Nominations for the branch officers were presented at this meeting by the nominating committee headed by *W. Bayer*.

An interesting movie, "*Sea of Strife*," was shown.

The speaker of the evening was *John W. Hassler*, director of research of the Industrial Chemical Div. of the *West Virginia Pulp & Paper Co.*, who spoke on the manufacture and use of activated carbon.

The April meeting was held on April 4th and *Joe Gurski* presented the very interesting and very solvent financial report of the branch.

Herb Head gave a short talk on the benefits we are receiving from the A.E.S. Research Program.

Earl Serfass, of Lehigh University, talked on the research project being conducted there — "*Plating Room Waste*."

A movie, "*The American Cowboy*," proved to be very interesting.

Refreshments were served after adjournment.

****

Imperial Plating Rack Co., has opened a new plant at 1008 E. Ten Mile Road, Hazel Park, Mich. for plating rack manufacture and coating.

This is another expansion for this firm which is associated with *The National Rack Co.*, of Paterson, N. J. and *The American Rack Co.* of Chicago.

Plant manager of the new plant is *Duane Faulman*.

****

The Udylite Corporation will start construction of a research laboratory building on a 23 acre site on Hoover Road near Eight Mile Road in Detroit as soon as the weather permits.

****

According to *Cleve Nixon*, president of the American Electroplaters Society, Detroit area manufacturers of metal finishing equipment and supplies have taken the lead in reserving space at the 1952 Industrial Finishing Exposition scheduled for Chicago's International Amphitheater, June 16-20. The show is expected to bring together the greatest array of metal finishing equipment and supplies ever assembled under one roof.

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Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Cincinnati Branch

The Cincinnati Branch of the American Electroplaters' Society conducted its monthly meeting on March 26, 1952, with some forty members and guests present with President *Robert D. Miller* in the chair.

Since our constitution only provided for a Vice-President, and since we had lost our Vice-Presidents the last two years due to their leaving the city, it was felt that we should have both a 1st and 2nd Vice-President. Accordingly, *Article IV* would be amended so that the first sentence of Section 1 would read as follows:

"The officers of the Branch shall be President, 1st Vice-President, 2nd Vice-President, Secretary, Treasurer, Librarian and Board of Managers."

Section 3 of Article IV would be titled 1st Vice-President and amended to state, "The 1st Vice-President shall perform the duties of the President in the event of absence, death or resignation of the President."

Section 3a would be inserted after *Section 3* of Article IV entitled "2nd Vice-President." "The Second Vice-President shall perform the duties of President in the absence of the President and Vice-President. He shall be chairman of the Educational Committee and shall perform such other duties as may be assigned to him by the President of the Board of Managers."

Upon unanimous vote this amendment to the Constitution was passed.

The next order of business was the election, and despite the presence of wardheelers and various political shenanigans, the following were elected to serve for the ensuing year:

President—*Robert D. Miller.*
1st Vice-President—*C. H. Truman.*
2nd Vice-President—*Wm. Gordon.*
Librarian—*C. Barth.*
Secretary—*Charles Wise.*
Treasurer—*Chas. T. Nuzum.*
To Board of Managers—*Wm. Albohn.*

With the exception of *Messrs. Gordon, Barth* and *Albohn*, all were officers who were re-elected for second and third terms.

The President then appointed the following Delegates and Alternates to the National convention in Chicago in June:

Delegates:	Alternates:
S. Chipman	*W. Gordon*
F. Bonem	*J. Beck*
C. T. Nuzum	*R. Miller*

It was announced that the annual picnic would be held on June 7, 1952, at *Devou Park, Ky.* (just across the river from Cincinnati) with golf, baseball, and horseshoes available. A dinner will be served at approximately $3.00 per person—to be paid for by the members with liquid refreshments being contributed from the Branch treasury.

The names of *Robert K. Rarick, W. B. Stephenson, Jr., Robert L. Majors* and *Donald William Gusse* (student) were then presented for membership in the Society, and were unanimously accepted.

President Miller presented *Walter Prine* of the *International Nickel Co.* who took "*Aspects of Industrial Nickel*

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Plating" as his subject. He stated that in normal times approximately 28,000,000 lbs. of nickel is used in the United States of which about 20% goes into nickel plating. Some of the applications of nickel other than decorative types was discussed such as:

1. Catalysts.
2. Electroforming & Electroplating
3. Electronic Instruments.
4. Plating on non-conductors.
5. Plating for Wear Resistance
6. Plating for Corrosion Resistance.
7. Plating of Tubes & Pipes, etc.

Mr. Prine offered various types of nickel solutions, a copy of which becomes a part of these original minutes, with a discussion then following.

We were the guests of the *Harshaw Chemical Co.* at the usual Social Hour.

Chicago Branch

The Chicago Branch installed its new set of officers with a gala affair. On Friday, April 4th *John Ott*, nationally known television star of N.B.C. and "How Does Your Garden Grow?" program, gave a program of time-lapse photography in color, showing flowers during their growth and actually bursting into full bloom. It was very spectacular and much enjoyed by the ladies who were guests of the branch. Refreshments were served and a very non-educational and social evening was enjoyed by all. The officers installed were:

Ray Ledford—President.
Elmer Olson—1st Vice-president.
Ed Staneck—2nd Vice-president.
Paul Glab—Secretary-Treasurer.
Joseph Andrus—Librarian.
Board of Managers—Dr. Monaweck. Harold Faint. Rudy Hazucha.

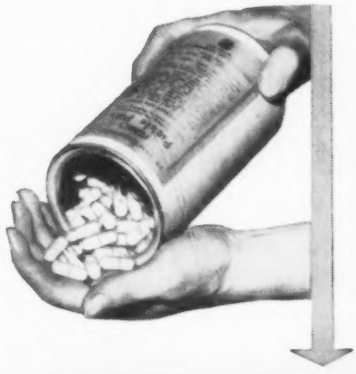
Twin City Branch

The Twin City Branch met on Thursday, March 6th in the Lodge Room of the Covered Wagon Cafe in Minneapolis. There were 40 persons present.

Following dinner, Branch President *Wray Schorr* introduced the following guests: Messrs. *Robert Tepley* and *Warren Johnson*, of Northwest Airlines; *Carl Dover*, of Wyandotte Chemicals; *Russell Ohmdahl*, of Brown & Bigelow; *Earl E. Kauffmann*, of the Electrochemicals Dept., E. I. Du Pont; *Roman Rossa*, of Cornelius Co.; *Winston Sabatka*, *Frank Hetznecker* and *John Weeks*, all of Minneapolis Honeywell Regulator Co.; *William Robb*, of Sterling Varnish Co., and *Olie Lenmark*, a manufacturers agent.

One of the highlights of this meeting was the presentation to all of the Past Presidents of the Twin City Branch their Past Presidents pins. Pins were presented to the following: *E. H. Lindemann* (Charter President), *Paul W. Felt* (Brown & Bigelow), *Gordon W. Lillicrop*, of Minneapolis Honeywell Regulator Co., *A. T. Leonard*, of Superior Plating & Rustproofing Co., and *Dr. Frank Ireland*, of Brown & Bigelow. Pins were also presented in absentia to *A. C. Bowman*, of Minneapolis Honeywell Regulator Co. and *Albert Joyner, Sr.*, of The Silver Shop, all Past Presidents who were not able to attend this meeting.

The nominating committee, *E. H. Lindemann*, Chairman, gave the following report: President, *Jerome M. Weller*, of Brown & Bigelow; 1st Vice-President, *Paul W. Hesse*, of the Union Brass & Metal Manufacturing Co.; 2nd Vice-President, *George C. Reed*, of Minneapolis Honeywell Regulator Co.:



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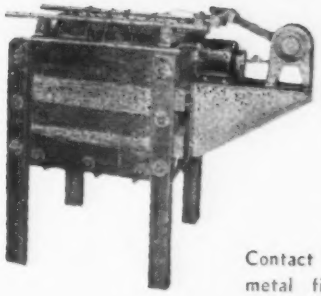

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Secretary-Treasurer, *Robert L. Luckley*, of Industrial Chemical & Equipment Co.; Librarian, *Fred Kiam*, of Superior Plating.

Following the business meeting, Branch President *Wray Schorr* turned the meeting over to *Henry Makino*, Acting Librarian, of Minneapolis-Honeywell Regulator Co. who introduced a representative of the E. I. Du Pont de Nemours & Company who showed the movie on the "Du Pont story." This movie was greatly enjoyed by all present.

New York Branch

The meeting was called to order by *Mr. George Herrman*, the President, on Friday, March 14th, 1952 at the Hotel Statler, New York City.

Applications for membership were received from the following: Messrs. *James H. Ewing*, *Samual Ratoff*, *Herbert C. List*, *Vito M. Mattera*, *Arthur Dubsky*, *David Weiss*, *F. Augustine*, *Joseph H. Weitze* and *William Weitze*.

It was decided to set aside a page

Cleveland Branch

The annual dinner and dance of the Cleveland Branch of the A.E.S. was held on March 8 at the Carter Hotel, Cleveland. A large turnout was on hand to enjoy a delicious meal, talented entertainment, and a night of tripping the light fantastic. From all reports, the baby-sitters of Cleveland earned a lot of overtime pay on the night of March 8th.

Scenes at Cleveland Annual Dinner-Dance

Earl Shamp, G. Wiegand, Mr. Riggenbaugh, Mr. & Mrs. W. Henry, and Mrs. V. Siefert relax after a hearty meal. Where did the boys get those boutonierres?

Bob Renton's table party includes Mr. & Mrs. L. Pivarcy and Mr. & Mrs. Larson. Is that the Hope diamond being worn by Bob's pretty missus?

This is not the chorus line, but Mrs. John Baker, Mrs. John Kiminas, Mrs. G. Stevenson, Mrs. N. Morelli, and Mrs. J. Rhoads could do all right on Broadway.

Mr. & Mrs. D. Lefever, Mr. & Mrs. J. Welker, Mr. & Mrs. Ross and Mr. & Mrs. J. Beeman find the table company too interesting to get up and dance.

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in next year's annual book in memory of the late *Mr. Horace Smith*. The entire branch stood in a moment of silence out of respect for his memory.

Elections for new officers then followed. The following men were elected:

President—Mr. A. Amatore.
Vice-President, 1st—Mr. A. Fusco.
Vice-President, 2nd—Mr. D. Hartshorn.
Financial Sect.—Mr. M. Maher.
Librarian—Mr. P. L. Veit.
Sergeant of Arms—Mr. F. Briganti.
Secretary-Treasurer—Mr. G. Shore.
Recording Sect.—Mr. L. Levinson.
Board of Mgrs.—Mr. G. Herrman.
Delegate—Mr. G. Shore.
Alternates—Mr. J. Sterling, Mr. M. Nadel, Mr. L. DeWaltoff.
Education Committee—Mr. A. Carlson, Mr. L. DeWaltoff.
Honorary Members—Mr. William Foss, Mr. Joseph Minges.

After the meeting, *Mr. Ed Rinker*, of the *Bart-Messing Corp.*, gave the branch a very interesting talk on plating tubing for the A.E.C. with nickel and silver, employing insoluble anodes.

Indianapolis Branch

The March meeting held at the usual place, Fox Steak House, on March 6th, with 31 members present for steak dinner and 44 for business meeting. Minutes of last meeting read and approved—Chairmen of various committees of the annual educational session and dinner dance held at the Indianapolis Athletic Club April 26th gave their reports.

The following were elected as delegates to Annual Convention of A.E.S. to be held in Chicago June 16-19-1952: *T. Evans* and *Dr. A. Max*. The branch secretary is automatically a delegate. Alternate delegates elected were *Don Patrick, C. Weekly, Q. Shockly, Mr. Edward Burton*, of P. R. Mallory Co. was elected to membership.

The Librarian, *Mr. E. Lundberg* introduced our own member *Mr. Rex Oyler*, Supt. of Plating, Guide Lamp Co. Anderson, Ind. His subject was "*Plating Quality*," which covered various phases of automotive parts plating.

There were many questions asked showing wide interest in Mr. Oylers' talk. Meeting adjourned at 9:50 P.M.

Pittsburgh Branch

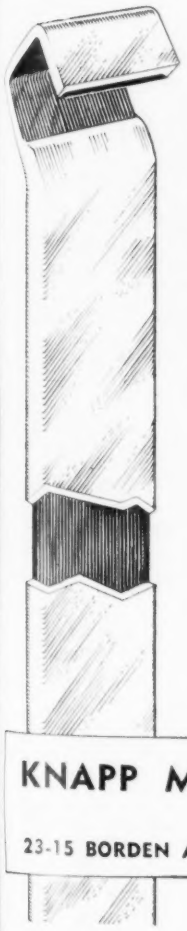
The Pittsburgh Branch of the A.E.S. held its monthly meeting at the Sheraton Hotel on March 13. Twelve (12) members enjoyed a delicious dinner prior to the business meeting and there were a total of twenty-eight (28) members at the meeting itself.

The Treasurer gave his report of the financial status of the Branch and *Art Kaupe* reported the progress of our Annual Banquet plans.

One of our members, *John Guthrie*, also a member of the Electrochemical Society, requested suggestions for a speaker to present a talk on Electrodeposition at a meeting at the Alcoma Country Club. *Mr. George Jernstedt* and *Mr. Ed Smith* were both highly recommended as speakers for this meeting on June 13.

We were all saddened to learn of the death of *Horace Smith*, who was a member of the Newark Branch and one of the Society's most active workers. *Sam Johnston* presented a short eulogy in honor of Horace. One minute of silence was observed by all members present in respect for Mr. Smith's passing.

Our election for the officers of 1952-53 was then held. The officers for the



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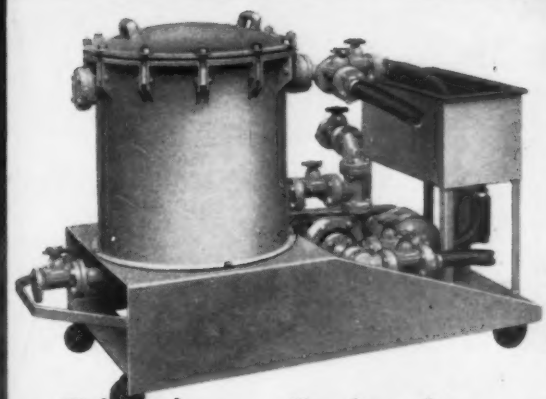

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next term are: *Rex Goldbach*, President; *Art Kaupe*, First Vice-President; *Bob Varner*, Second Vice-President; *Rudy Schindler*, Secretary; *Damon Antel*, Treasurer; *Herb Peters*, Librarian. Delegates to the convention are: *Bob Woofter*, *Ed Smith*, *Ed Washburn*; alternate delegates, *Rex Goldbach*, *Carl Yerger*, and *G. S. Woodruff*.

Sam Johnston has recommended *Herb Saylor* for honorary membership in the Pittsburgh Branch. Herb has many years standing as one of the most active and hard working members of our Branch. Many years ago when the Branch was in its infancy Herb worked tirelessly towards building the Branch as it is today. We are all well aware of Herb's contribution to the Pittsburgh Branch and its members, and the decision was unanimous to bestow honorary membership on Herb as a token of our esteem.

Bob Varner, our Librarian, turned the meeting over to our co-member, *George Jernstedt*, who presented to us a very interesting film titled, "*Visit to Electroplating Projects*," courtesy of Westinghouse Electric Corp. The subject laboratory, which Pittsburgh is fortunate in having in our area, is one of the most modern laboratories in the United States. We feel that a film of this type is excellent publicity for both the Pittsburgh Branch and the plating industry. A rising vote of thanks was given Mr. Jernstedt for his own excellent personal portrayal of a subject which is seldom filmed.

Meeting was then brought to a close and refreshments were enjoyed by everyone.

Baltimore-Washington Branch

On Tuesday, March 11th, the Baltimore-Washington Branch met at the National Bureau of Standards and held its annual election of officers. Officers elected were: *George Best*, President; *V. J. Hughes, Jr.*, Vice-President; *Asaf Benderly*, Secretary; *William Metzger*, Treasurer; *Carroll Hudkins*, Librarian. Installation of these officers will take place at the April meeting.

After the business meeting, *Dwight Couch*, of the Bureau of Standards, presented the topic "*Electroplating of Aluminum*." Dwight's process is a new method which will shortly be published in the form of a paper.

Also shown was a technicolor film covering the history of aluminum.

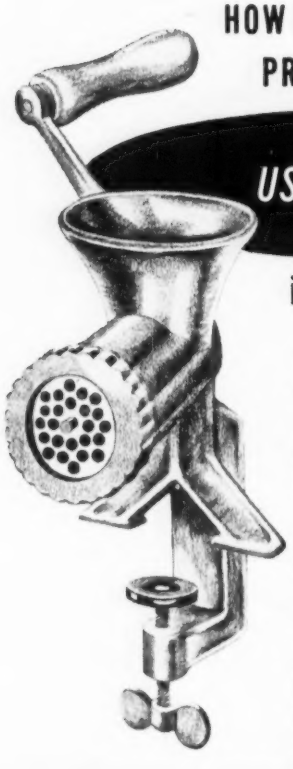
After adjournment refreshments were served and the meeting resulted in an evening of enjoyment in its entirety.

Twin City Branch

The Twin City Branch of the A.E.S. met on Monday, April 7th in the Lodge Room of the Covered Wagon Cafe in Minneapolis.

Following dinner, *Mr. Jerome M. Weller*, of the Minneapolis Regulator Co. served as Chairman of the meeting in absence of branch president *Wray Schorr*. The first matter of business was the introduction of the following guests that were present. Messrs. *Bernard Olson*, of Brown & Bigelow; *Donald Russell*, of Minneapolis Honeywell Regulator; *S. S. Cady*, *Robert Tepley*, *Warren Johnson*, all of Northwest Airlines; *Mr. . HE. Ehlert*, of the Detrex Corp., Chicago.

Mr. Roman Rossa, of the Cornelius Co., and *Mr. Arthur Coapman*, of the Udylite Corp. were introduced with the announcement that their application for membership had been accepted and they were new members of the Twin City Branch.



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Mr. Paul Hesse, of the Union Brass & Metal Manufacturing Co., gave a report on the coming annual Twin City Branch of Party which will be held on Monday, June 2nd, 1952 in the Lodge Room of the Covered Wagon Cafe. Mr. Hesse also gave a report on the Twin City Branch's convention exhibit. He stressed the importance of our sumitting exhibits for the convention and advised he would follow this matter.

The meeting was turned over to *Mr. E. H. Lindemann*, of Minneapolis Honeywell Regulator Co., who served as chairman of the nominating committee for the purpose of the election of officers for the 1952-53 year with the following officers elected; President, *Jerome M. Weller*, of the Minneapolis Honeywell Regulator Co., 1st Vice-President, *Paul Hesse*, Union Brass & Metal Manufacturing Co.; 2nd Vice-President, *George Reed*, Minneapolis Honeywell Regulator Co.; Secretary-Treasurer, *Robert L. Buckley* of the Industrial Chemical & Equipment Co.; Librarian, *Fred J. Kiam*, Superior Plating & Rutproofing Co.; Board of Managers, *Adolph Levine*, The Cornelius Co.; *Ben J. Rosenthall*, of Wyandotte Chemical Co.; *Wray Schorr* of Hiawatha Metalcraft, Inc.; and *Mr. Frank Kilpatrick*, of Minneapolis Honeywell Regulator. The newly elected officers were given a rousing vote of confidence by the members present.

Following a short intermission the meeting was turned over to Branch Librarian *George C. Reed* who introduced *Mr. Roy J. Bierman*, of Minneapolis Honeywell Regulator Co., a member of the Twin City Branch, who spoke on "*A New Concept on Controls.*"

Los Angeles Branch

Myron H. Orbaugh, of the *Bone Engineering Co.*, Glendale, who served the branch outstandingly as first and second vice-president and educational committee chairman during the past three years, was elected president of Los Angeles Branch at the March 12 meeting in Rodger Young Auditorium, Los Angeles.

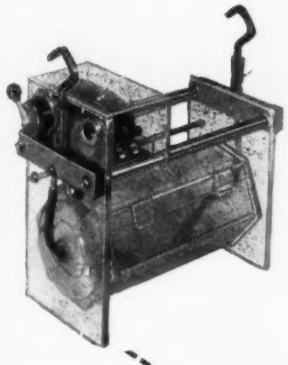
The choice was a popular one, for Myron brings to the branch presidency the invaluable qualities of leadership, resourcefulness and vision which the top post demands of its occupants.

As first vice-president, the membership chose popular and hard-working

Myron H. Orbaugh

John Millhorn, plating division supervisor for the *Mefford Chemical Co.* of Los Angeles. In tabbing John for the first vice-presidency the branch will have him handy for elevation to the presidency next year, and meanwhile will benefit from his boundless energy and enterprise in membership and attendance promotion, which fall within the scope of his new office.

Elmer G. "Dick" Richardson, of Long Beach, was re-elected to the office of second vice-president which



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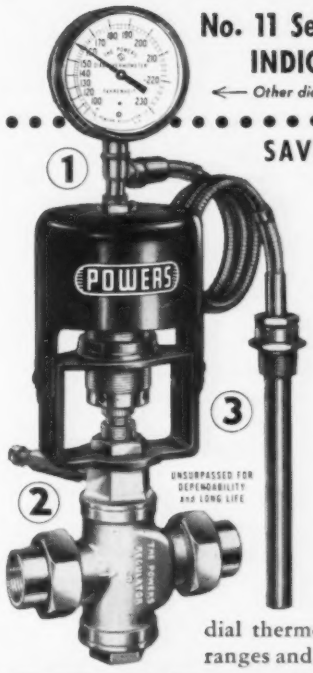

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he filled during the 1951-52 term.

G. Stuart Krentel, of Spence Electroplating Co., and *Earl Arnold* of *L. H. Butcher Co.'s* technical staff, traded jobs. Krentel, last year's secretary, was elected librarian, and Arnold, the 1951 librarian, was named secretary, both by unanimous vote. Their choice assures the branch of a continuance of the exceptionally fine service they rendered in those important offices during the past year, when both meeting attendance and the quality of the speakers reached a new high.

Francis O'Dell, of Surface Alloys, Inc., was the unanimous choice for treasurer, succeeding Peter B. Rogers, of Oakite, Inc.

Named to the board of managers were three past-presidents: Chairman, *Roy Lostutter*, Chrome Engineering Co., the retiring president; *Richard Wooley*, Modern Plating Co. (1950 president); and *Walter Behlendorf*, Spence Electro-plating Co. (1949).

Wooley, Behlendorf and Millhorn were chosen as delegates to the Supreme Society convention, with *Charles Borlet*, of United Chromium, Inc., and *Jack Raskin*, of L. H. Butcher Co., as alternates.

Annual Educational Session

The Twenty-Second Annual Educational Session of Los Angeles Branch culminating in a dinner dance in the evening, was held at Rodger Young Auditorium, Los Angeles, on March 22, with approximately 600 members, guests and their ladies attending the technical and social events on the program.

General Chairman *John D. Millhorn*, of the *Mefford Chemical Co.*, reported they were literally deluged with congratulatory messages the following week, which described the affair as the most successful, technically and socially, that has been sponsored by the branch.

The morning and afternoon technical sessions, at each of which two nationally-known speakers were presented drew attendances, respectively, of 111 and 140.

An effective arrangement was that of presenting the speaker's program in one auditorium and the exhibits in an adjoining room. This made it possible for the displays to be viewed and discussed without disturbing those listening to the talks.

Roy Lostutter, 1951-52 president, opened the technical session at 9:30 a.m. with welcoming remorks and then introduced Mr. Arnold, who acted as master-of-ceremonies in introducing the speakers and directing the question-and-answer discussion which followed each talk.

First speaker was *Dr. Henry Brown*, Udylite Corp., Detroit, Mich., whose subject was "*Corrosion Resistance of Electro-deposited Coatings.*" He described plated coatings, such as anodizing, chrome in combinations, etc. Dr. Brown also discussed humidity, salt spray and outdoor exposure tests. He devoted some attention to the mechanism of corrosion from the standpoint of whether it is due to the relative porosity of the metals as inherent in the metal itself or is induced by other factors.

The principles of processes being used and recent developments of two types of coatings were also included in his commentary: Coatings which are anodic to base metals, such as zinc, steel, etc., and coatings which are cathodic to steel, such as nickel and copper.

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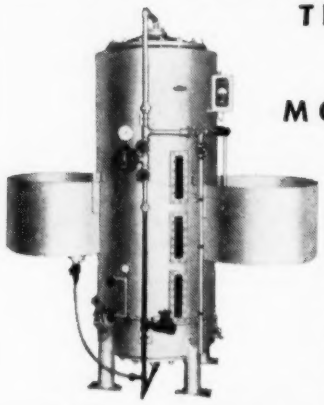

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Dr. Brown, in conclusion, presented illuminated slides which showed the results of corrosion tests by salt spray and outdoor exposure on nickel, brass, iron and various other metals.

The second speaker was *T. C. Adamson, Jr.*, research technician of the California Institute of Technology, Pasadena. While his talk on "*Jet Propulsion*" had no specific reference on metal deposition matters, it included some interesting information on stresses and alloys as developed for use in jet propulsion and super-sonic planes. Mr. Adamson's period drew the largest attendance of the day. The adjoining exhibit room was virtually deserted as everyone flocked to the room to see Dr. Adamson present a captured German film which showed actual experiments and test flights underway while the Nazis were developing rocket planes in the early 1940's.

An overflow crowd of 162 attended the noon-day luncheon at which Chairman *Ed W. Wells*, of the *L'Hommedieu Co.*, scrupulously invoked the branch's traditional proscription against "shop" talk at the luncheon. A high-light was the annual story-telling contest, with prizes offered for the best stories, as determined by volume of applause.

Herold Kroesche, John Millhorn, Larry O'Neill, Stuart Krentel and a dozen others entered the lists with a 'Have You Heard This One?". The winner was *William T. Wheeler*, a member of the staff of R. C. Hedeen's *R. C. H. Supply Co.* of Huntington Park, Calif. The moral of Bill Wheeler's heavy laugh-producer was that things are not always what they seem on the surface and circumstantial evidence should not be regarded as infallible. (*Editor's Note—Mr. Herr's reports are usually quite detailed. We can only conclude that his failure to let us in on the prize-winning story is an indication that it is not fit for the delicate ears of* METAL FINISHING'S *readers.*)

The afternoon technical session featured *Dr. Donald Price* of Oakite Products, Inc., New York. His subject was "*Cleaning for Metal Finishing.*"

In his capacity as chairman of the Supreme Society Research Committee, Dr. Price first outlined the current program of the committee, its objectives and the value of the research work which accrues to the membership in general throughout the United States, Canada and Australia. He made a plea for more vigorous application of individual branch campaigns for more sustaining memberships for the national research program.

Dr. Price devoted the technical part of this talk largely to a discussion of chemistry of wetting agents and how they function.

The final speaker was *Dr. M. M. Beckwith*, of Harshaw Chemical Co., Cleveland, O. The subject of his talk was "*Fluoborates in Plating Solutions.*"

The annual dinner-dance began at 7:30 p.m. in the main ballroom of Rodger Young Auditorium. Chester G. Borlet, Peter V. Rogers and Walter P. Behlendorf, the reservations committee, reported a ticket count of 431 for the evening affair. A magnificent array of door prizes had been assembled by Dexter Halldin, George Hetz, John Manning and Fred Raymond of the Door Prize Committee, so that practically one out of every three persons present went home with

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a prize. Those in charge of the drawings saw to it that no lady was embarrassed by wining a three-foot-high rubber-coated solution tank or gawky plating rack, while her escort walked off with a silver-plated fruit platter or table clock.

Out of an entry list of some 25 couples in the annual waltz contest, *Mr. and Mrs. Sam Perrino* (he's with Southwest Plating Co., Los Angeles) were declared the winners. Each was presented with a beautiful trophy donated by the *Kaag Manufacturing Co.*

In addition to those already mentioned, other members who worked diligently on committees were: Don Bedwell, Myron H. Orbaugh and Herold Kroesche as members of Arnold's educational committee; Registration, Frank Virgil and Harold Wanamaker; luncheon, Ed W. Wells; Exhibits, O. J. Jacobsen, Harold Wells and C. A. Peterson; Decorations, Gus Brigantino; entertainment, Larry O'Neil; favors, Jack Beall; and printed program preparation, G. Stuart Krentel.

April 9th Meeting

An accelerated drive for more sustaining memberships was launched at the April 9 meeting of Los Angeles Branch by *Jack Beall*, research committee chairman, in an effort to bring the branch's sustaining group closer to the expected total for branches of more than 200 members.

One commendable move initiated by Beall, which should be productive of results and serve as a developer of good will, is to have the heads of each firm which supports a sustaining membership as guests of honor at a designated meeting night.

In line with this new policy, April 9 was designated as *Crown City Plating Co.* Night. Representing the Pasadena plating concern were *Harold Coombes, Jr.*, son of the owner, *Ray Bray*, supervisor of plating operations, and *George Kennett*. Executives and plating foremen of other companies in the sustaining group will be similarly honored at subsequent branch meetings.

Beall made an appeal to the branch to exert more effort in signing additional sustaining memberships. He revealed that one new name had been added during the past month—*Virtue Brothers Co.*, of Los Angeles—bringing the total to 12. This figure, while gratifying, Beall remarked, is still inconsistent with a branch membership of more than 200. He pointed out that the Supreme Society Research Committee feels that approximately 20 per cent of a branch membership should be represented by research sustaining memberships. On that basis Los Angeles should have around 40, leaving quite a margin to make up.

Beall called for some remarks on the subject from *E. L. Combs*, of the Diamond Alkali Co., Paynesville, O., guest speaker of the evening, who is chairman of the research committee for Cleveland, O., Branch of the A.E.S. Mr. Combs contributed some excellent information on national research activities, largely in the form of reading a copy of a report by *Ralph Sharpe* of the supreme society's delegates' meeting held in Chicago in February.

Mr. Combs added that Cleveland branch at present has 19 sustaining membership, which the branch also regards as inadequate in view of the fact that Cleveland membership is approximately the same as Los Angeles' —205 to 211, respectively, according to the latest national report.

Beall displayed copies of printed re-

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ports of half a dozen completed research projects. He said that individual copies are available to members for a nominal sum by writing to the national office. Upon motion of Dick Wooley of Modern Plating Company, it was decided to present a copy of each project report to the Los Angeles Public Library for filing in its technical department.

Three membership applications were approved. Scheduled for initiation at the May meeting are: *Alex Heller*, Atlas Plating Co.; *Robert Schwartz*, Dubois Co.; and *Melvin Maul*, F. E. Olds Co. Guests introduced included *Jule Born*, of Virtue Brothers Co.; *Al Coombes, Jr.*, of Crown City Plating Co.; *E. L. Combs*, Diamond Alkali Co., Paynesville, O.; and *Walter King*, Braun Corp., Los Angeles.

A report by Treasurer *Peter Rodgers* revealed the branch to be in a healthy financial condition with all bills paid. *John D. Millhorn*, general chairman of the annual educational session in March, reported a handsome profit made despite overhead considerably higher than in previous years. The committee's generous action in presenting each of the 20 waitresses on duty during the banquet with a finely plated compact was lauded as a splendid public relations gesture.

The new branch officers, who were elected at the March meeting, were installed. *Earl Coffin* served as installing officer, the 12th year Earl has performed this job with distinction. In the feature ceremony, *Roy Lostutter*, who guided the branch since April, 1951, surrendered his gavel of authority to the new president, *Myron Orbaugh*, of the Bone Engineering Co., Glendale. The complete list of new officers was published in the March, 1952, issue of METAL FINISHING.

The speaker of the evening was *E. L. Combs*, of Diamond Alkali Co., Paynesville, O. Mr. Combs presented an exceptionally complete and informative paper entitled "*Chromic Acid—Manufacture, Distribution and Research.*"

Chicago Branch

Chicago Branch members turned out in record numbers on Friday, April 4, for one of the busiest and best meetings ever held.

The program was a ladies night affair which included dinner, a special colored movie on flowers, door prizes, installation of officers, member-getter's awards and a final meeting night hour of fellowship and refreshment.

The record attendance was well over 150 including 61 ladies. After cocktails and dinner all retired to the auditorium for a special showing of *John Nash Ott's* beautiful and educational movie of growing flowers. Roses, irises, camellias, gladioli, tulips and a host of nature's floral wonders grew from bulbs and seedlings to radiant full bloom on colored film through the magic of Mr. Ott's exclusive time-lapse photography.

Chicago's officers for the '52 convention year were then introduced and installed with appropriate ceremonies noting Chicago's 40th year under the direction of *Mr. H. J. Gilbertson*, honorary life member and past national president. *Ray Ledford* was re-elected as president with *Elmer Olson* and *Ed Stanek* as first and second vice-presidents. The perennial *Paul Glab* will again discharge the duties of secretary while *Joe Andrus* attends the librarians office as he has so ably done in the past years. The board of managers with *Dr. Monaweck* as chairman in-

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Ladies door prizes were then awarded with *Mrs. Catherine Swenson*, *Mrs. H. Stopek*, *Mrs. E. McCoy* and *Mrs. Harold Younger* carrying off merchandise certificates as a token of their attendance.

In concluding the current membership drive, *Chairman Ewell McCoy* awarded first prize, an electric waffle maker, to *Lenny Pravel*, with *Mr. Clindinning* winning two neck ties for his excellent efforts. A total of 28 new members joined Chicago Branch as a result of this membership drive. Retiring officers then submitted their annual reports and it was especially noted that Chicago Branch now has 379 active members.

Afterwards everyone adjourned to the dining room for midnight refreshments and fellowship.

"They Were There" Department

A pleasure to see *George & Mrs. Unverzagt* after a long absence from Chicago affairs . . . *Matt Dassinger* was there too, but then he always is . . . New member. *Charles Norcross*, brought *Mrs. Norcross* along and took the occasion to announce an expected addition comes summer time . . . *Mr. & Mrs. Longfield* (Of the McHenry Longfields) started worrying about their chickens at midnight . . . *Mrs. Ralph Zullo* excitedly inquiring of *Mrs. Ledford* about the next ladies night and the whereabouts of her husband all in one breath . . . *Scotty Morrison* out for the evening with his son fresh from the wars in naval uniform . . . The *Edward Stacks* and the *Edwin Stacks* adding class to the affair (Just a little bit of confusion too) . . . *Mr. & Mrs. Bob Runzel* giving out with a big hello . . . *Bob Maxant* and *Frank Lenz* in heated discussion at the dinner table—something about a 100 to 1 wager to be settled on the golf course with Ed Stanek holding the stakes . . . *Mr. & Mrs. Ovide Bedard* had to leave early but they stayed late—a compliment to *Joe Andrus* for an excellent program . . . *Mr. & Mrs. Paul Glab* with son *Jerry* and his ever present speed graphic camera . . . *Hattie Schneider* missed winning a prize for the first time in a long time . . . *Mrs. Harold Younger* kept the prize winning tradition in the *Standard Rack* family by winning one of the attendance awards . . . *Mr. & Mrs. H. A. Gilbertson* enjoying the evening—after counting the house, Mr. Gilbertson said, "Just like old times."

METAL FINISHING SUPPLIERS ASSOCIATION

Proposed By-Laws Ready for June Meeting Discussion

At the annual meeting of the *Metal Finishing Suppliers Association, Inc.*, to be held at the Conrad Hilton Hotel in Chicago during the week of the annual A.E.S. convention and Exposition, the following By-Laws will be up for discussion.

Members are urged to study these By-Laws and come to the annual meeting prepared to discuss and ratify them in a final approved form.

ARTICLE I

Name

The name of this Association is as set

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CLEANS — POLISHES
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forth in the certificate of incorporation, METAL FINISHING SUPPLIERS' ASSOCIATION, INC.

ARTICLE II

Offices

The registered office of the corporation shall be at No. 83 Parmelee Avenue, in the Borough of Hawthorne, County of Passaic and State of New Jersey, and the name of the agent therein and in charge thereof upon whom process against the corporation may be served, is THOMAS A. TRUMBOUR.

The corporation may also have an office in the City of Newark, County of Essex and State of New Jersey, and also offices at such other places as the Board of Trustees may from time to time appoint or the business of the corporation may require, either within or without the State of New Jersey.

ARTICLE III

Seal

The corporate seal shall have inscribed thereon the name of the corporation, and the words "Corporate Seal, 1951, New Jersey."

ARTICLE IV

Objects

The objects of this corporation are:

(1) To promote the interests of the Metal Finishing industry, by furthering the welfare of the suppliers and customers of the products and supplies used in the industry, and to safeguard the interests of the ultimate consumer and user;

(2) To co-operate with organizations in the metal finishing field, to promote mutual objectives;

(3) To foster and strengthen acquaintanceships and promote a spirit of co-operation among the members;

(4) To co-ordinate efforts in the common interest for concerted action in matters generally affecting the business of serving the industry, including the application thereto of sound business and ethical principles;

(5) To appear on behalf of the Association and its members before Legislative committees, governmental departments and agencies and other bodies and to co-operate with such committees, etc., regarding matters affecting the industry and to promote the interests of the Association and its members and the public.

ARTICLE V

Membership

(1) Membership in the Association shall consist of suppliers of equipment, materials, and service to the metal and allied finishing industry who are manufacturers, distributors, jobbers or manufacturers' agents or other firms or persons who are actually engaged in some form of service to the industry, which, in the opinion of the Board of Trustees, entitles them to membership;

(2) Members shall be limited to those who are duly designated by persons, firms and corporations who qualify under Section 1 hereof. Employment in the industry is not sufficient to qualify for membership. However, a member may designate another to hold such membership in his, it or their names and to vote on his, it or their behalf;

(3) Foreign persons, firms or corporations may be admitted to membership under such rules and regulations as the Board of Trustees may from time to time determine, provided, however, that no statute, regulation or rule of the United States of America, its departments and agencies is violated thereby;

(4) Each member of the Association shall be entitled to one vote upon all questions presented to the membership.

ARTICLE VI

Dues and Assessments

The Board of Trustees shall recommend to the annual meeting of the members, an annual assessment in such an amount as it shall determine to be required to meet the budgeted expenses of the Association for the ensuing year, which amount, if favorably acted upon by a majority of the members, shall be met by voluntary contribution from the members;

The fiscal year of the Association shall begin on August 1st, and end on July 31st;

There shall be no initiation fee.

ARTICLE VII

Management

The management of the corporation shall

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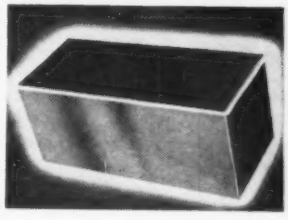

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be vested in the board of trustees, eight in number, one of whom shall be a resident of this State, and shall hold office for a term of one year or until their successors are elected, and during the first year of the corporation shall consist of the parties named in the certificate of incorporation. During each succeeding year, the board of trustees shall consist of the immediate past president, president, first vice-president, second vice-president, third vice-president and treasurer, and two parties elected by the members at the annual meeting. Vacancies in the office of trustee shall be filled by election at the annual meeting or by a majority vote of the trustees;

ARTICLE VIII

Officers

(1) The officers of the Association shall be a president, a first vice-president, a second vice-president, a third vice-president, a secretary and a treasurer, all of whom but the secretary shall be elected by the members at the annual meeting of the corporation. Either the president or the secretary may be eligible to the office of treasurer;

(2) The term of office of the several officers shall be for one year, and shall begin at the close of the annual meeting at which they are elected, and each officer shall hold office until his successor has qualified;

(3) In the event of a vacancy in the office of president, the first vice-president shall become president of the Association and shall serve until the next annual election. Vacancies in the office of first vice-president, second vice-president, third vice-president, secretary and treasurer, and in the office of trustee, shall be filled by a majority vote of the board of trustees to serve for the un-expired term.

ARTICLE IX

Meetings

(1) The annual meeting of the Association shall be held at such time and place as the board of trustees may designate, which time and place shall coincide as nearly as possible with the time and place of the annual convention of the American Electroplaters' Society, but the president or any three officers may call a special meeting and designate the time and place thereof;

(2) Thirty days' notice of the time and place of any meeting shall be served upon all members either personally or by mailing the same to their address, as shown on the books of the Association.

ARTICLE X

Amendments

These by-laws may be amended in the following manner:

The proposed amendment set forth in words at length and signed by at least ten active members, addressed to the board of trustees, shall be delivered to the secretary at least 30 days before the annual meeting. The board of directors, at a meeting to be held before the annual meeting of the corporation, shall consider the proposed amendment and act thereon.

The original proposal, together with a notation thereon of the action taken by the board of trustees shall then be presented to the Association at its annual meeting for action thereon, and shall become effective when approved by a majority of the members. Voting thereon shall be either in person or by proxy;

ARTICLE XI

Order of Business

At the annual meeting of the Association, the order of business shall be as follows:

1. Reading of the minutes of the last meeting;
2. Report of the board of trustees, including the report of the secretary-treasurer, and the reports of the standing committees in the order named;
3. Deferred business;
4. New business;
5. Election of trustees;

ARTICLE XII

Meeting of the Board of Trustees

1. The board of trustees shall hold a regular meeting immediately preceding the annual meeting of the Association;
2. Special meetings of the board of trustees shall be held at such time and place as the president, or in his absence the first vice-president may designate;
3. Twelve days notice of any meeting of the board of trustees shall be given to all members of the board, either personally or by mailing the same to his address, as shown on the books of the Association;
4. At all meetings of the board of trustees, the order of business shall be as follows:

Reading of the minutes of the last regular meeting of the board of trustees and/or of any special meeting, the minutes of which have not been approved.
Approval of bills;
Communications from the President;
Communications from the Treasurer;
Communications from the Secretary;
Report of Committees;
Unfinished business;
New business;
Discussion of programs for future activities of the Association;

ARTICLE XIII

Quorums

1. A quorum of the board of trustees shall consist of four members;
2. A quorum of the membership shall consist of a majority of the members present and voting.

ARTICLE XIV

Duties of Officers

1. The President shall preside at all meetings of the Association and of the board of trustees and shall be the chief executive officer of the Association;
2. The Vice-Presidents, in the order of their designation, shall assume the duties

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and responsibilities of the President in case of his death, disability or absence from fulfilling his duties;

3. The Secretary shall keep the minutes and such other official records and reports of the Association as the board of trustees may direct. He shall conduct the official correspondence of the Association. Such minutes, records and books shall be kept at such place as the board of trustees may designate;

4. The Treasurer shall keep account of all moneys received and deposit the same in the name of the corporation in such depository or depositories as shall be designated from time to time by the board of trustees. He shall not disburse any moneys of the Association except in such manner and for such purpose as shall be approved by a committee designated by the board of trustees. At each meeting of the board of trustees, he shall submit a report of the financial condition of the Association, and at the annual meeting of the Association he shall submit a detailed report of the financial operations and condition of the Association for the preceding fiscal year;

5. The Treasurer shall give bond in such an amount and with such surety as may from time to time be required by the board of trustees, provided that the cost of such bond shall be borne by the Association;

ARTICLE XV

Committees

The President may appoint the following standing committees and such other committees as may be authorized by the board of trustees, each of which shall consider and report upon matters pertaining thereto:

Executive and Finance;
Legislative;
Membership;
Program;
Reception;
Constitution and By-Laws;
Resolutions;
Trade Promotions;
Public Relations;
Nominating committee.

Each committee shall consist of at least two members. The President shall be ex-officio a member of all committees;

ARTICLE XVI

Suspension and Termination of Membership

Membership in the Association may be terminated in the following manner:

1. By voluntary resignation, in writing, signed by the member;

2. By a vote of a majority of the members of the membership committee on a formal charge, in writing, that a member has been guilty of conduct prejudicial to the welfare of the Association, which charge shall particularize the conduct of the member alleged to have been prejudicial;

3. The action of the membership committee shall be subject to review by the board of trustees, which action shall also be subject to review at the next annual meeting of the Association.

AMERICAN SOCIETY FOR TESTING MATERIALS

ASTM Committee B-8 Report on Electrodeposited Metallic Coatings

Committee B-8 for several years has considered a photographic comparison method of rating plated specimens. After a number of revisions and discussions within the sub-committee it is believed that this rating system is now in shape to be offered for publication.

In the studies on thickness and porosity, a number of round-robin tests are nearing completion, and it is expected the results of these tests will furnish needed information to serve as a basis for standards. *A Recommended Practice for Preparation of Copper and Copper-Base Alloys for Electroplating* is currently out for letter-ballot approval of the committee. In addition to this practice and others for stainless steel, aluminum, and zinc-base die castings which were approved last year, similar work is being undertaken for other materials, including the plating of malleable and gray iron. As task group on plating of plastics has been organized recently, and the work in this field of plating as well as in the field of lead and lead alloys will be initiated in the near future.

Sub-committee V on *Supplementary Treatments of Metallic Coatings* is planning a program to correlate accelerated tests with performance tests. The exposure environments will include two outside exposures, a box exposure in an unheated warehouse, and accelerated tests. A section of this subcommittee dealing with cadmium treatments has completed preparation of more than half of the 900 panels being prepared for exposure. In June the committee will inspect its lead and copper - nickel - chromium specimens which are on atmospheric exposure at State College, New York City, and Kure Beach.

Officers of Committee B-8 are: Chairman: *C. H. Sample*, The International Nickel Co., Inc., New York, N. Y. Secretary: *R. B. Saltonstall*, The Udylite Corp., Detroit, Mich.

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